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MINISTRY OF EARTH SCIENCES
भारत मौसम विज्ञान विभाग
INDIA METEOROLOGICAL DEPARTMENT

जम्मू और कश्मीर की जलवायु CLIMATE OF JAMMU & KASHMIR



CLIMATOLOGICAL SUMMARIES OF STATES SERIES - No. 20

ISSUED BY

OFFICE OF THE
ADDITIONAL DIRECTOR GENERAL
OF METEOROLOGY (RESEARCH)
INDIA METEOROLOGICAL DEPARTMENT
PUNE - 411 005



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P R E F A C E

The importance of meteorology and its economic and social benefits are being increasingly realised all over the world. In our country also, various sectors like agriculture, aviation, power and energy, tourism, shipping, transport industry etc., require climatological information pertaining to different regions of the country, for planning and executing the different projects, with a view to derive maximum advantage from meteorological and/or climatological conditions. Keeping these requirements in view, it was decided by India Meteorological Department to publish a series of "Climatological Summaries" for each state in the country, incorporating the district climatological summaries. The twentieth issue in the series of 'State Climatological Summaries' is "Climate of Jammu & Kashmir" The climate of this state is prepared for the first time.

The present publication contains extensive information on rainfall, temperature, wind, humidity, clouds and other weather parameters in Jammu & Kashmir state and in all districts of the state, and other information on climatic classification, coefficient of rainfall variation, droughts, excessive rainfall, cyclonic storms/depressions, western disturbances and earthquakes are also included in the publication. The state is mostly hilly terrain with several valleys and rivers. Hence climatic conditions vary from place to place in the state. Spatial distribution of two main climatic elements – rainfall and temperature have been elaborated and depicted in maps. Spatial temperatures for representative months of all seasons have been determined by applying lapse rate of representative months considering topographic features of the location. Climatic classification over the state is determined by using Koppen's technique.

The contributions for preparation of climatological summary and related maps have been made by Shri G. S. Dhekne, Shri S. M. Deshpande, Smt. U. S. Satpute, Shri R. S. Wayal, Smt. P. R. Iyer, Smt. P. P. Bhagwat and Shri A. B. Dhule from "Climatological Publication Section" of the Office of the Additional Director General of Meteorology (Research), India Meteorological Department, Pune.

The publication has been prepared by Dr. T. P. Singh, Director and reviewed by Shri B. Mukhopadhyay, LACD-ADGM(R). Shri S. Krishnaiah, LACD-ADGM(R) provided the guidance during his tenure for this publication. I appreciate their sincere efforts.

I am hopeful that this publication will be extensively useful source of climatic information in various sectors for development of Jammu and Kashmir state.

NEW DELHI
JULY 2014

DR. L. S. RATHORE
DIRECTOR GENERAL OF METEOROLOGY

**INDIA METEOROLOGICAL DEPARTMENT
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16.	Abstract	The publication contains extension information on the climate of Jammu & Kashmir and its districts based on rainfall, temperature, winds, clouds and other weather parameters. The information on droughts, excessive rainfall, depressions and cyclonic storms and earthquakes are also included in the publication.
17.	Key words	State Summary, District Summary, Physical Features, Climatic Classification, Heaviest Rainfall, Highest Maximum Temperature, Lowest Minimum Temperature, Rainfall Variability, Seasonal Rainfall, Annual Rainfall, Mean Maximum Temperature, Mean Minimum Temperature.

INTRODUCTION

The climatology of the state of “Jammu and Kashmir” in terms of various meteorological parameters such as temperature, rainfall, rainfall variability, pressure, winds, relative humidity, clouds, weather hazards, etc., is described in the state summary, followed by a detailed description of the climate of each district considering topographic characteristics of the location. In this publication, the districts of “Jammu and Kashmir” state which were in existence as on 1st January 2012 have been considered and the climatology of these districts, arranged in alphabetical order is presented.

The normals for monthly and annual rainfall are generally based on the data for the period 1951 to 2000 and when sufficient data is not available for particular district, available data for the period 1901-2000 is also utilized. The monthly and annual normals of other meteorological parameters used for describing the climate are generally based on data for the period 1971 to 2000. The extreme values of temperature and rainfall presented in the publication are based on the updated data up to the year 2010. The data are obtained from National Data Centre, Pune.

The information on cyclones and depressions affected the state during the period 1891-2013 are included in state summary. As Jammu and Kashmir state is a seismic prone region, the information on earthquakes of moderate or high intensity occurred in the state during the period 1862-2013 are also incorporated in the summary.

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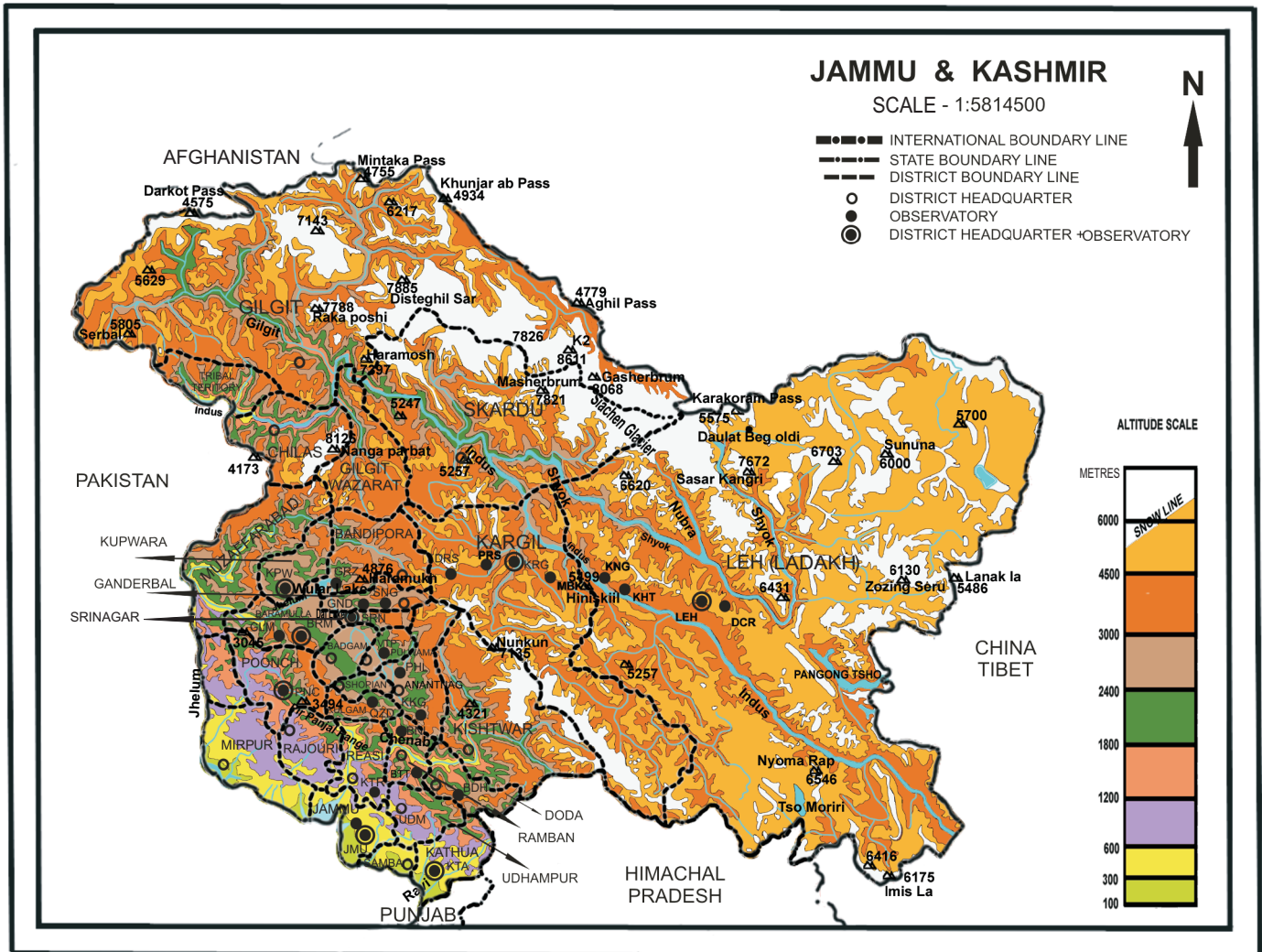
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FIG: 1 :PHYSICAL FEATURES OF JAMMU AND KASHMIR STATE



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FIG: 1(a) : INSET

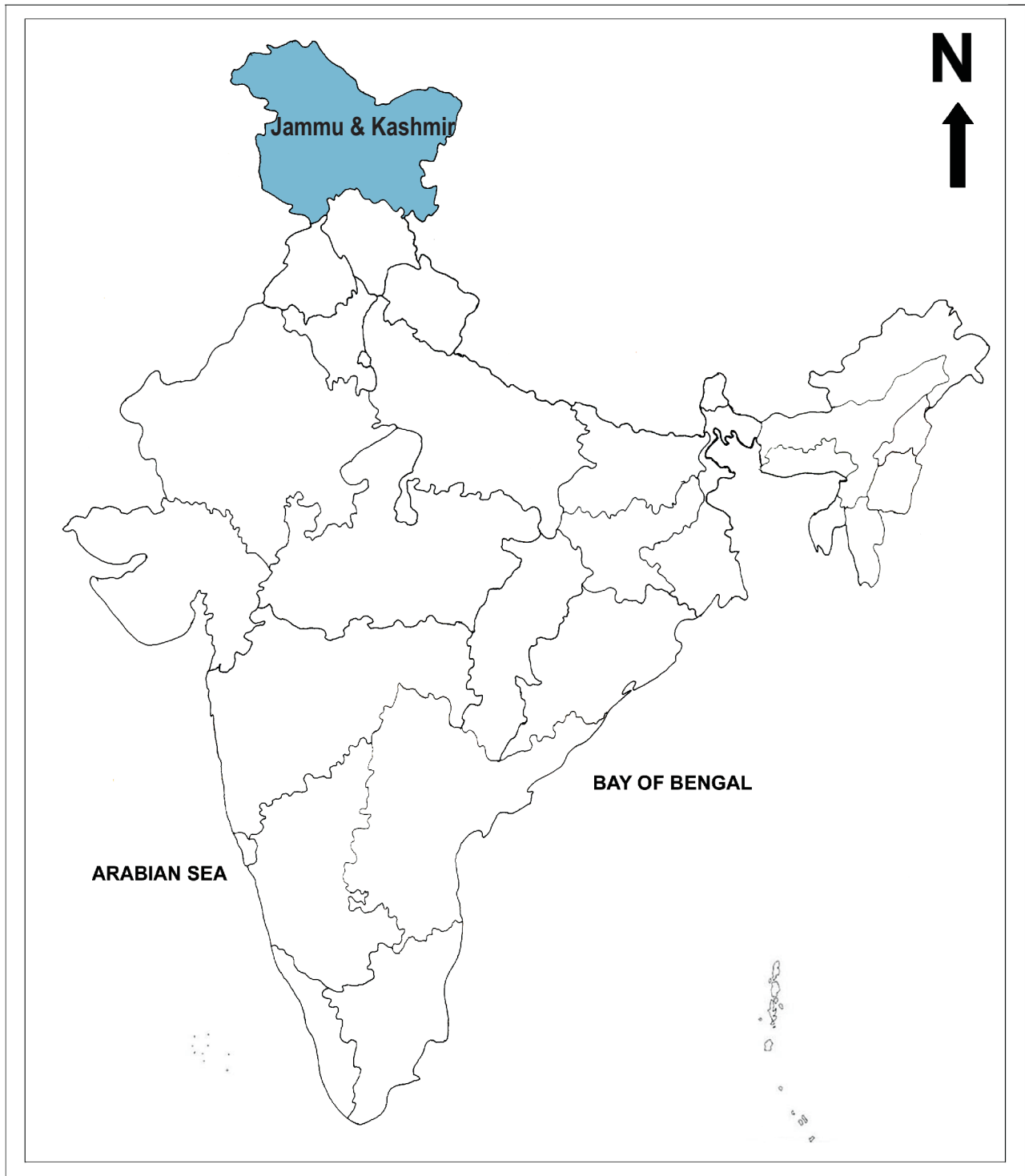
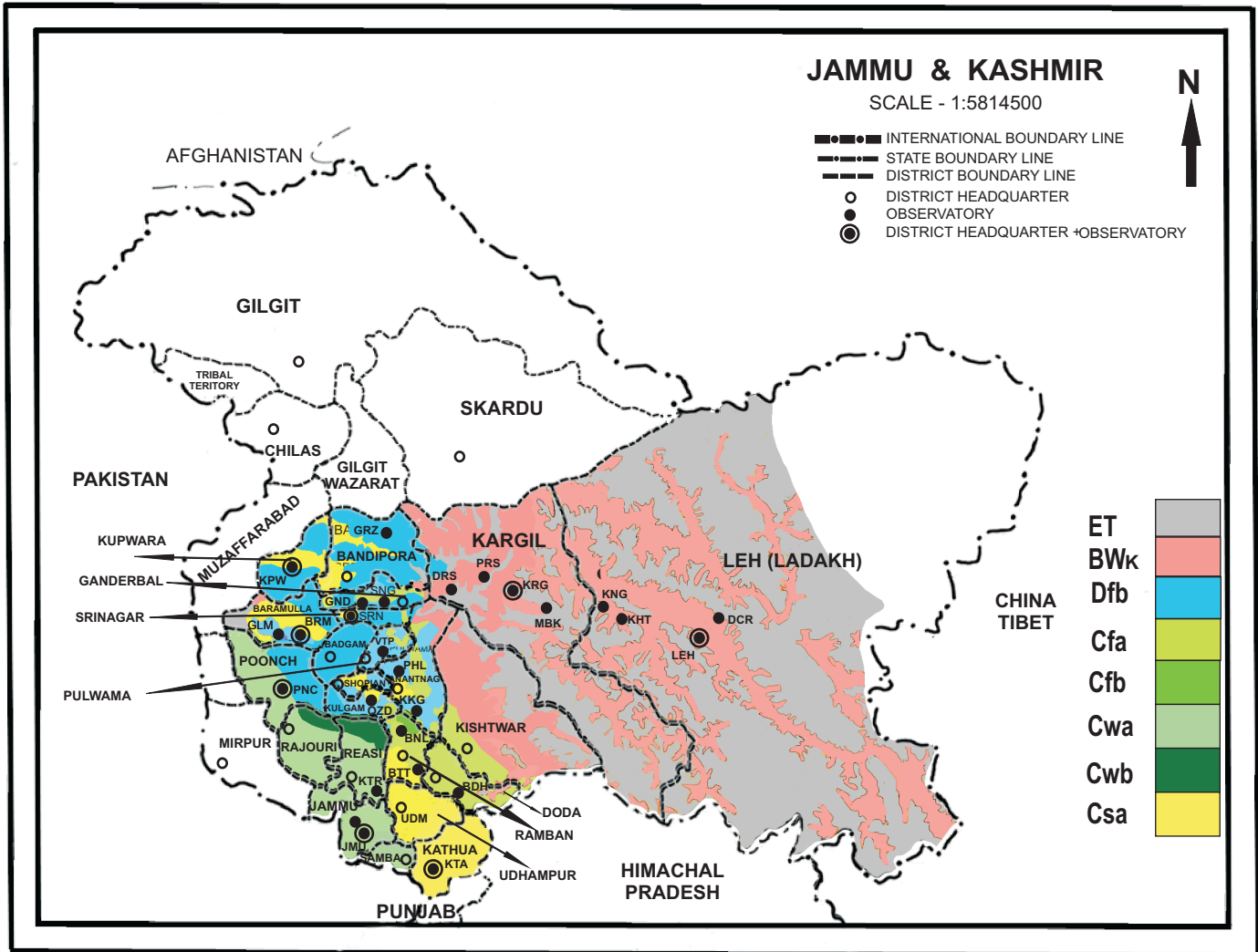
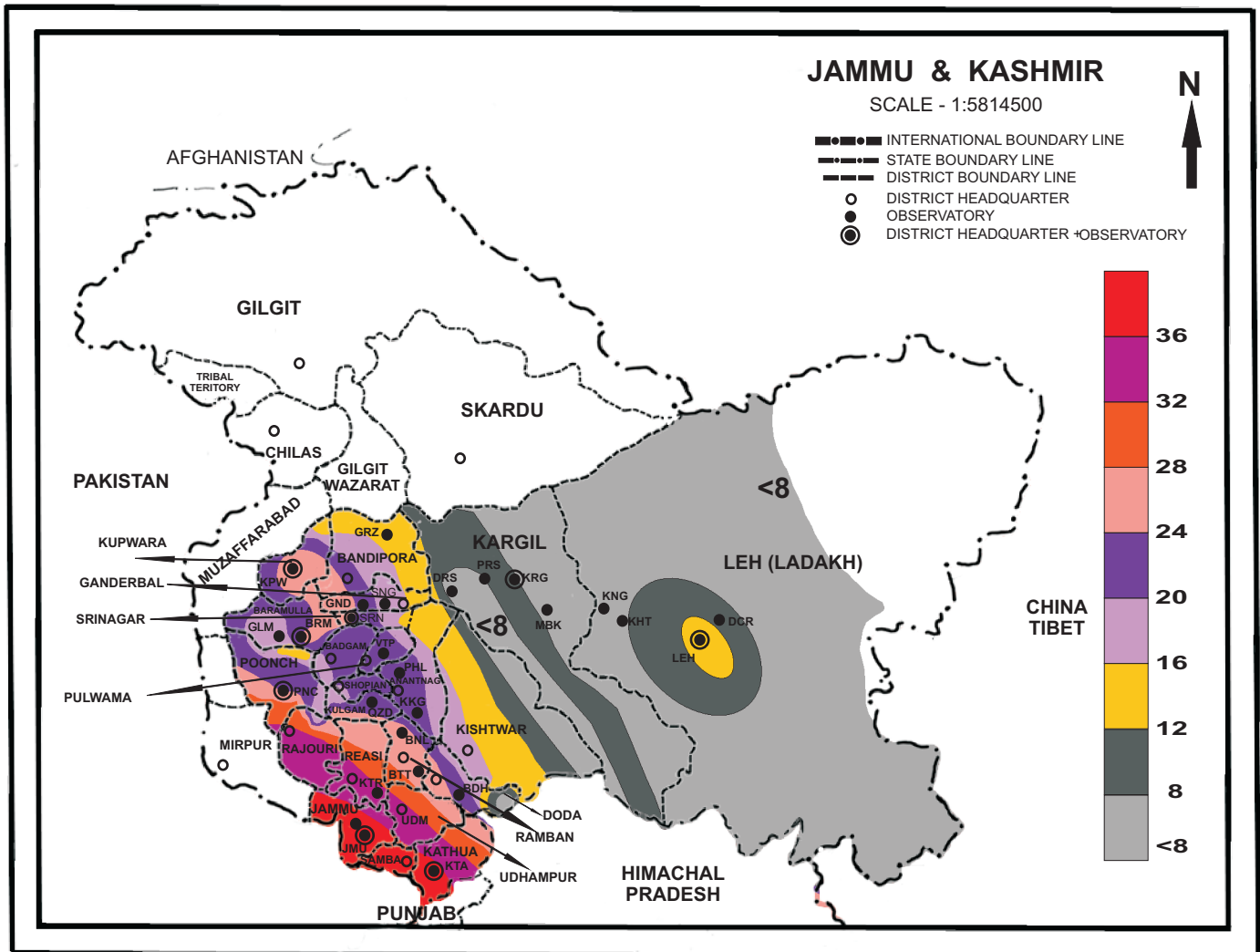


FIG:2: CLIMATIC CLASSIFICATION



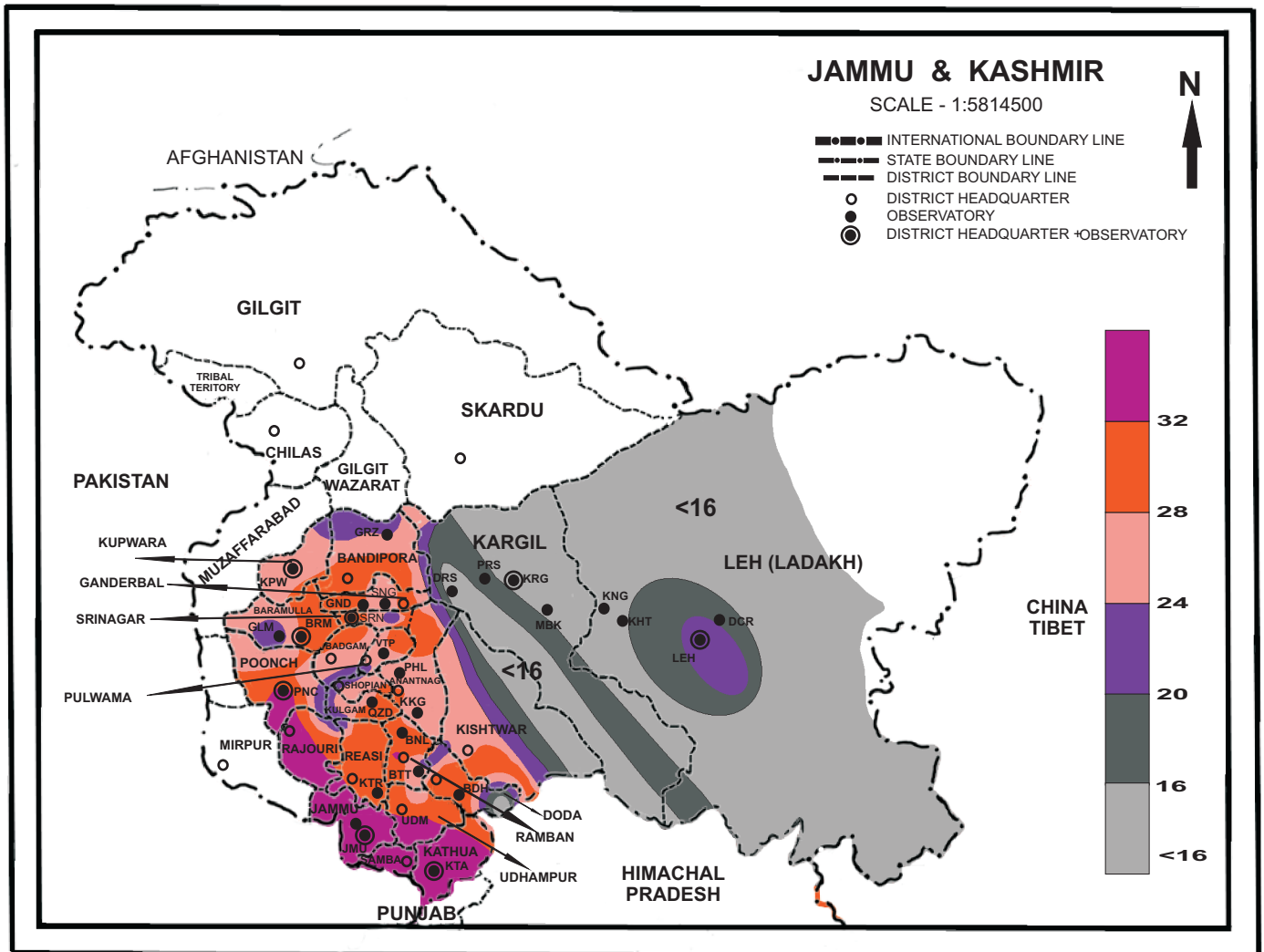
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FIG: 2(a) : MEAN MAXIMUM TEMPERATURE (°C) - MAY



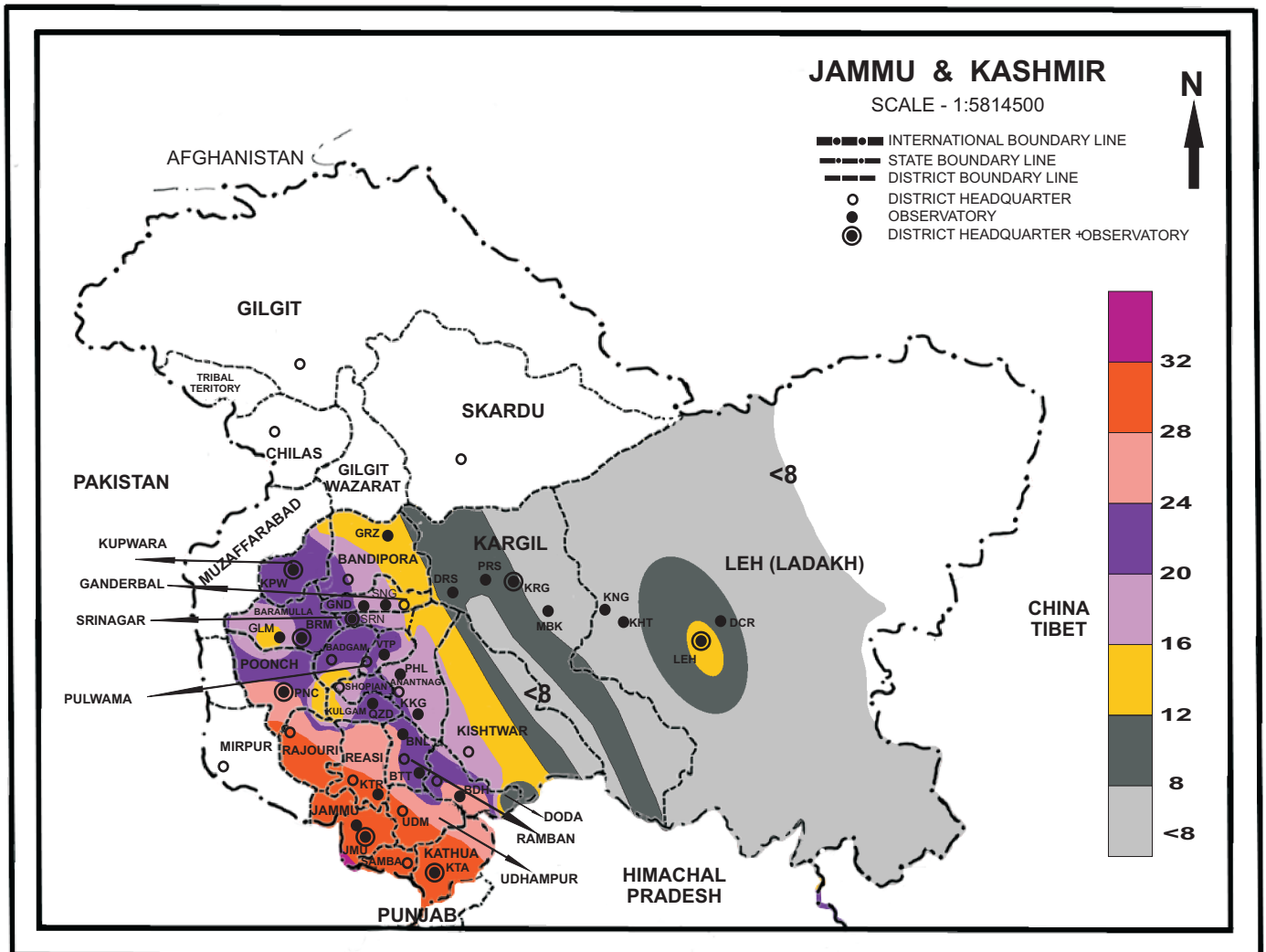
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FIG:2(b) :MEAN MAXIMUM TEMPERATURE (°C) -JULY



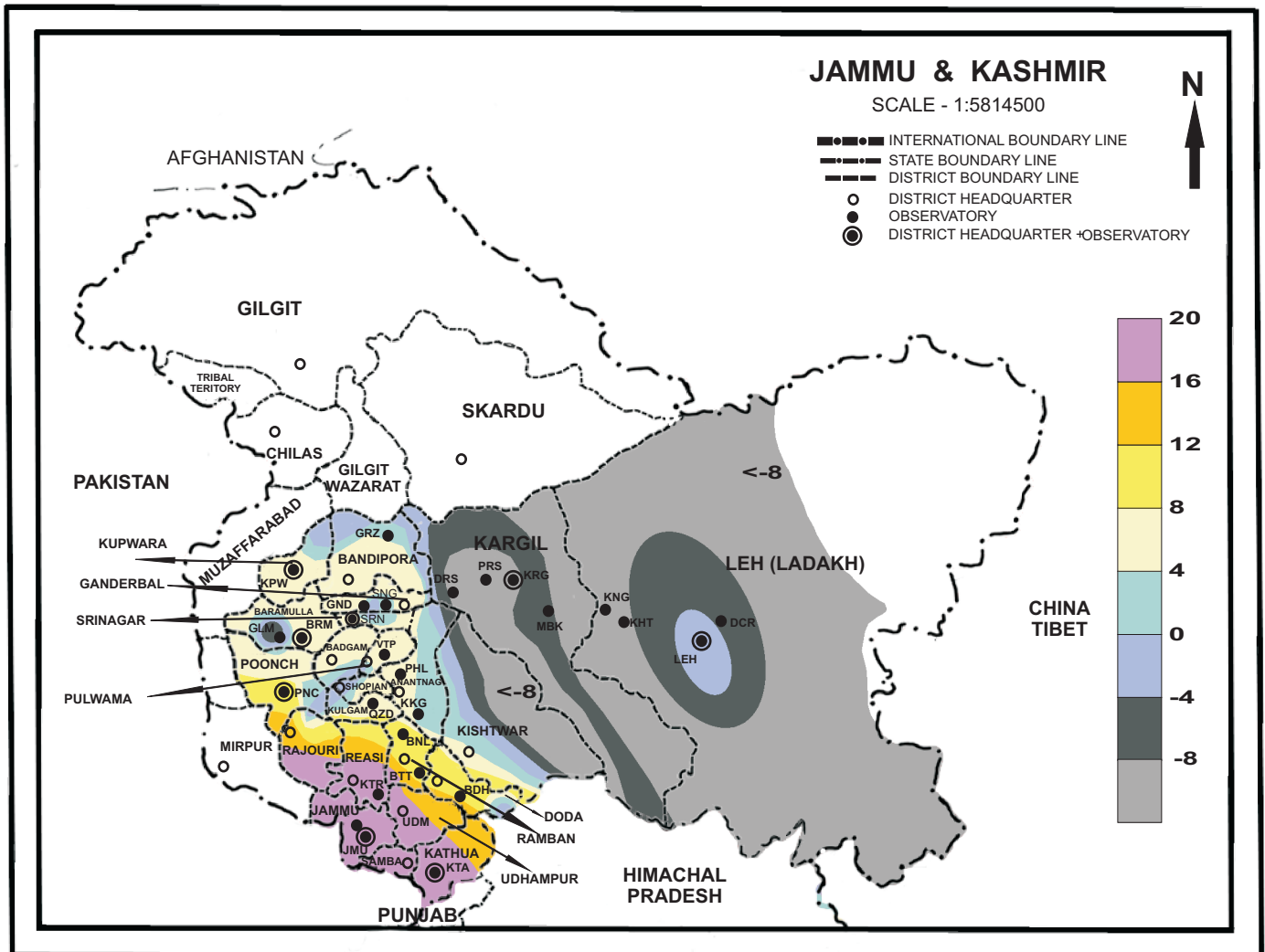
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FIG: 2(C) :MEAN MAXIMUM TEMPERATURE (°C) - OCTOBER



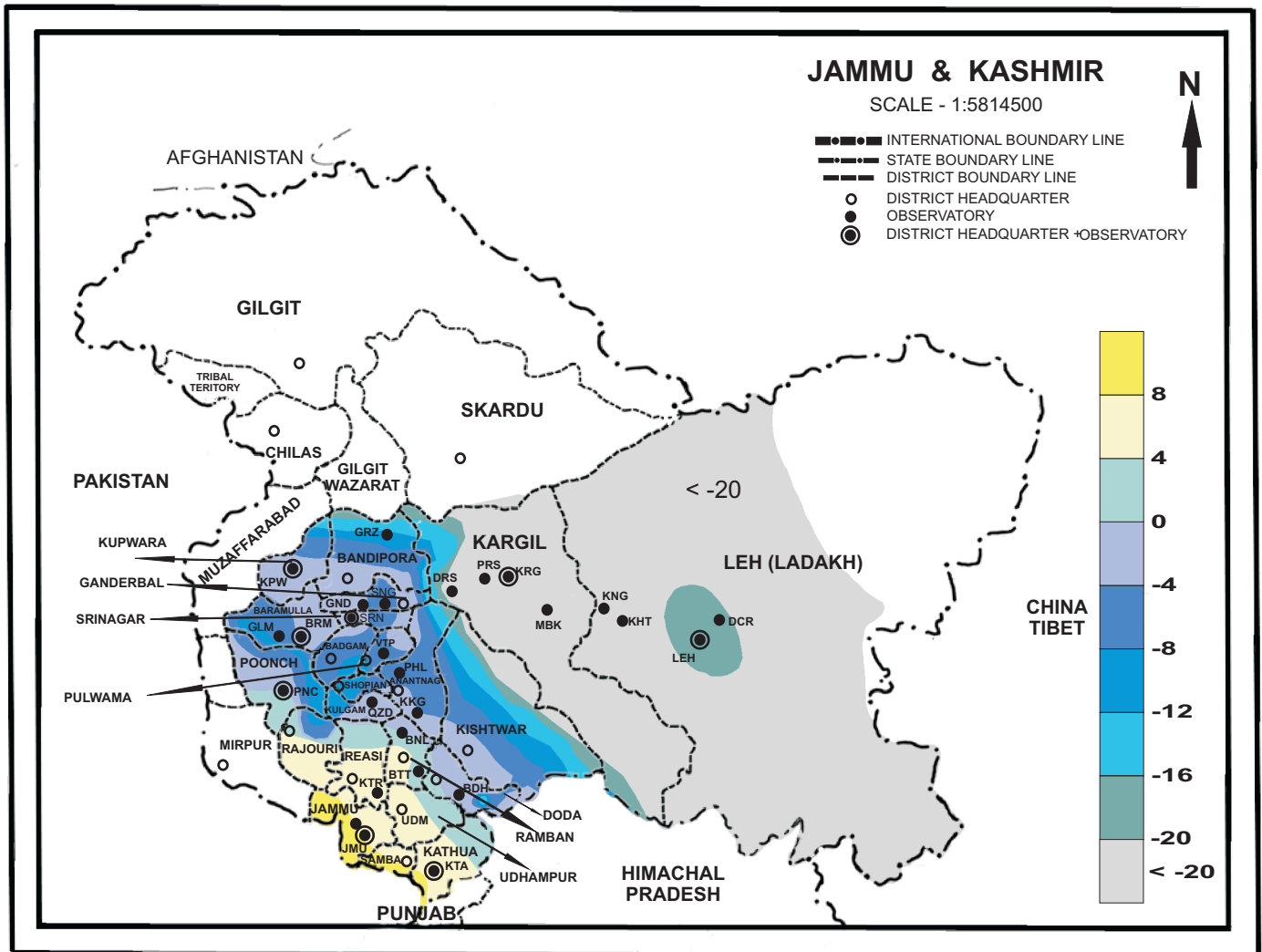
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FIG. 2(d) : MEAN MAXIMUM TEMPERATURE (°C) - JANUARY



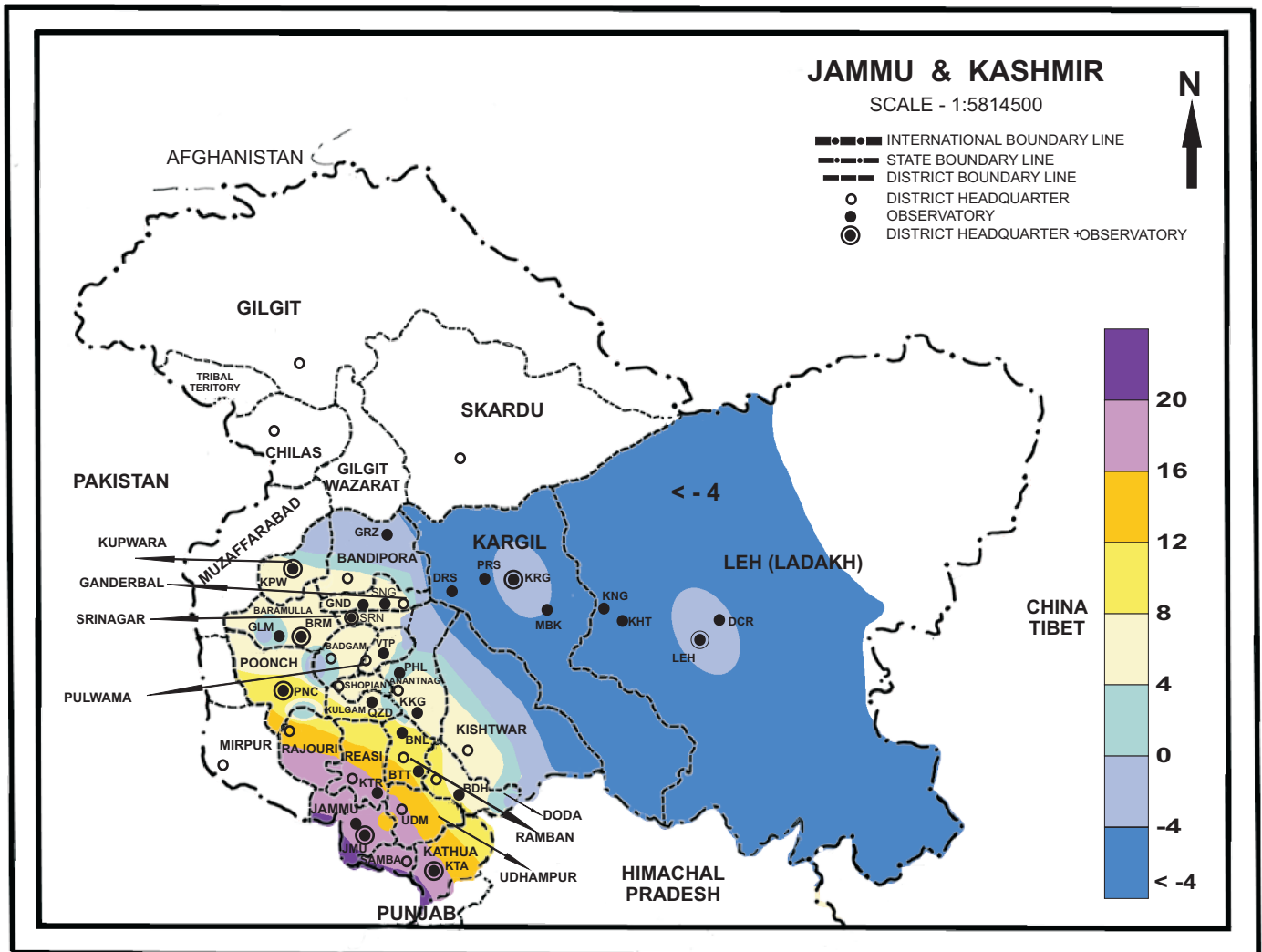
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FIG. 3(a) : MEAN MINIMUM TEMPERATURE (°C) - JANUARY



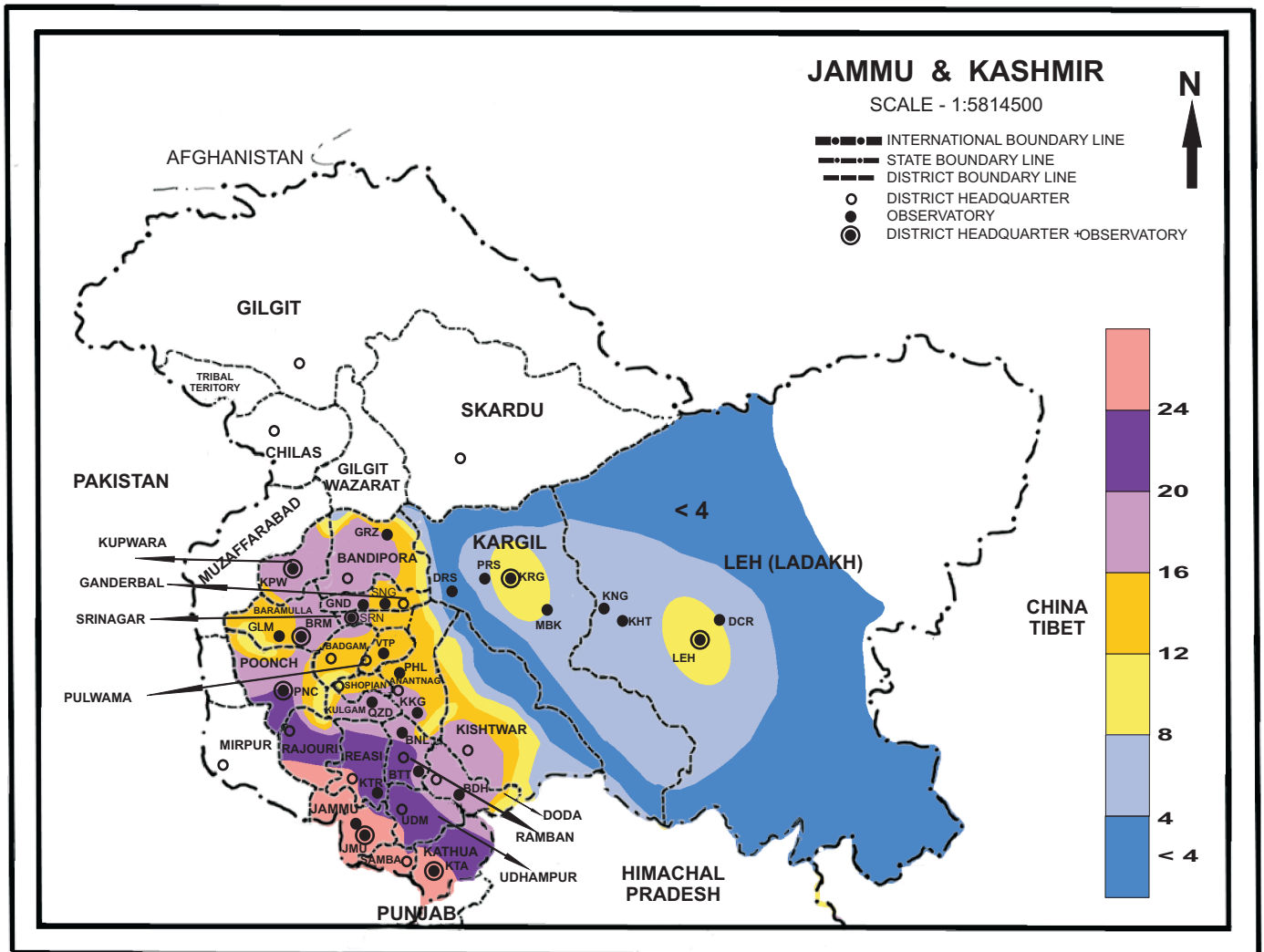
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FIG: 3(b) :MEAN MINIMUM TEMPERATURE (°C) - APRIL



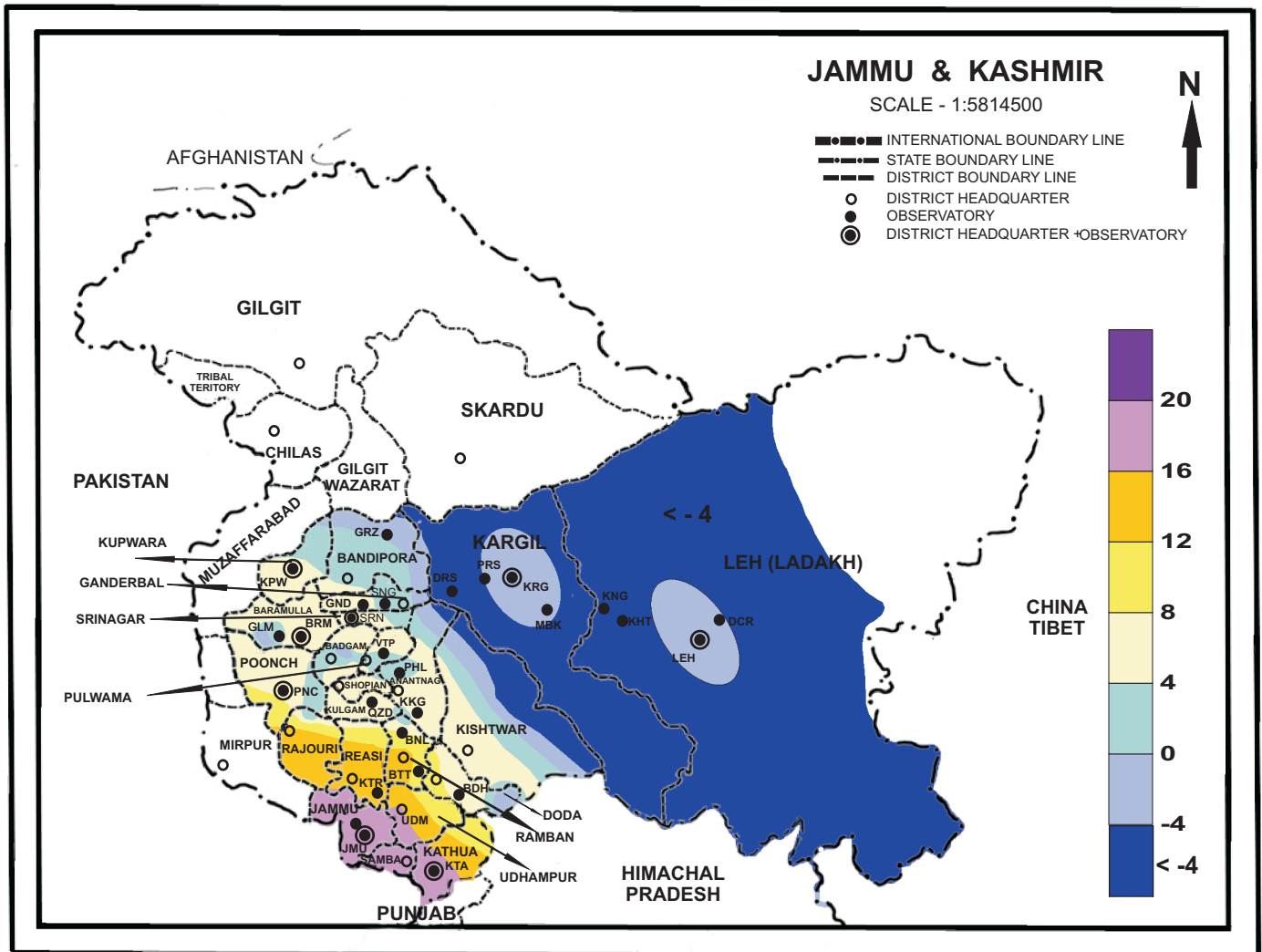
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FIG: 3(c) : MEAN MINIMUM TEMPERATURE (°C) - JULY



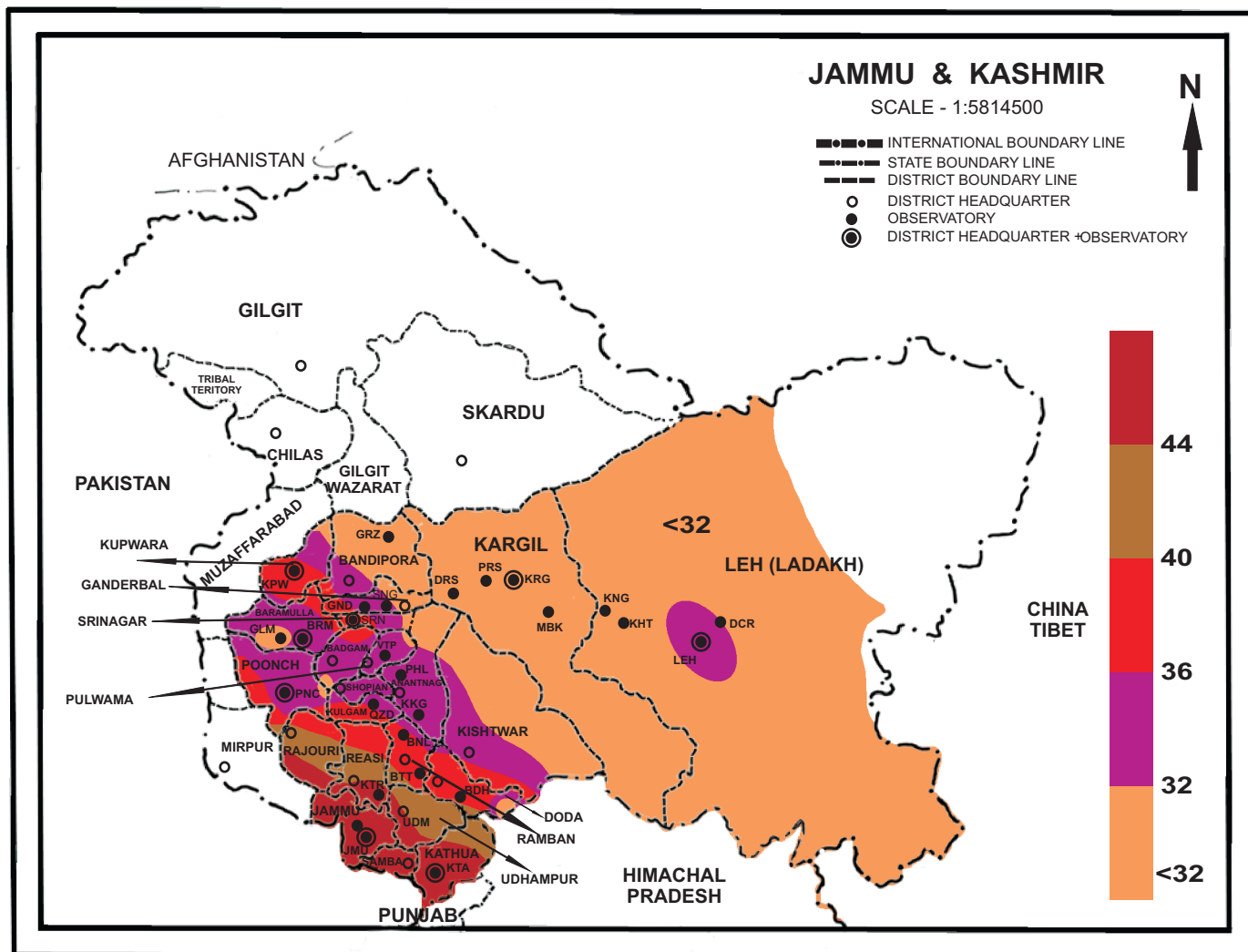
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FIG: 3(d) : MEAN MINIMUM TEMPERATURE (°C) - OCTOBER



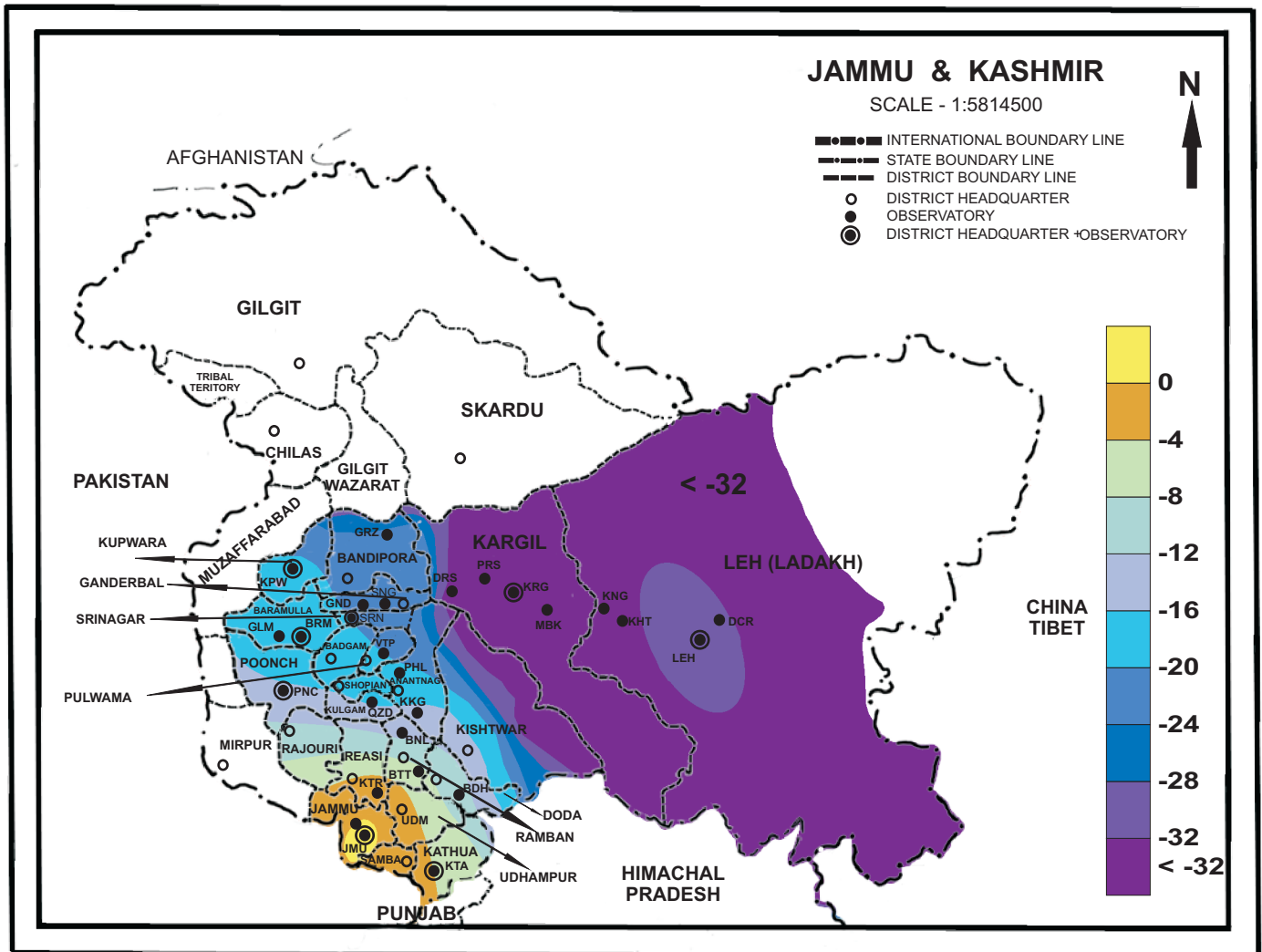
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FIG: 4 : HIGHEST MAXIMUM TEMPERATURE (°C) EVER RECORDED



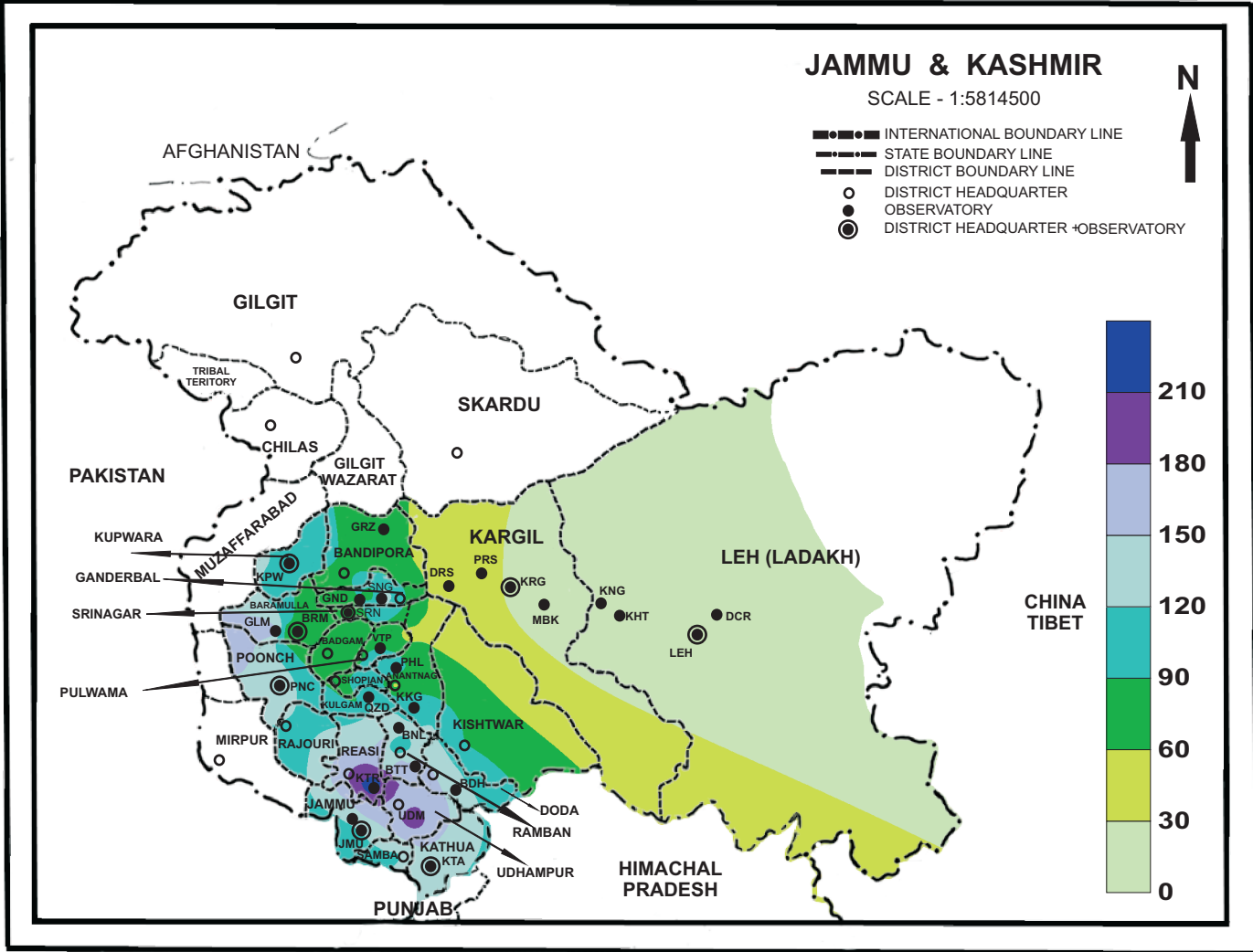
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FIG: 5 :LOWEST MINIMUM TEMPERATURE (°C) EVER RECORDED



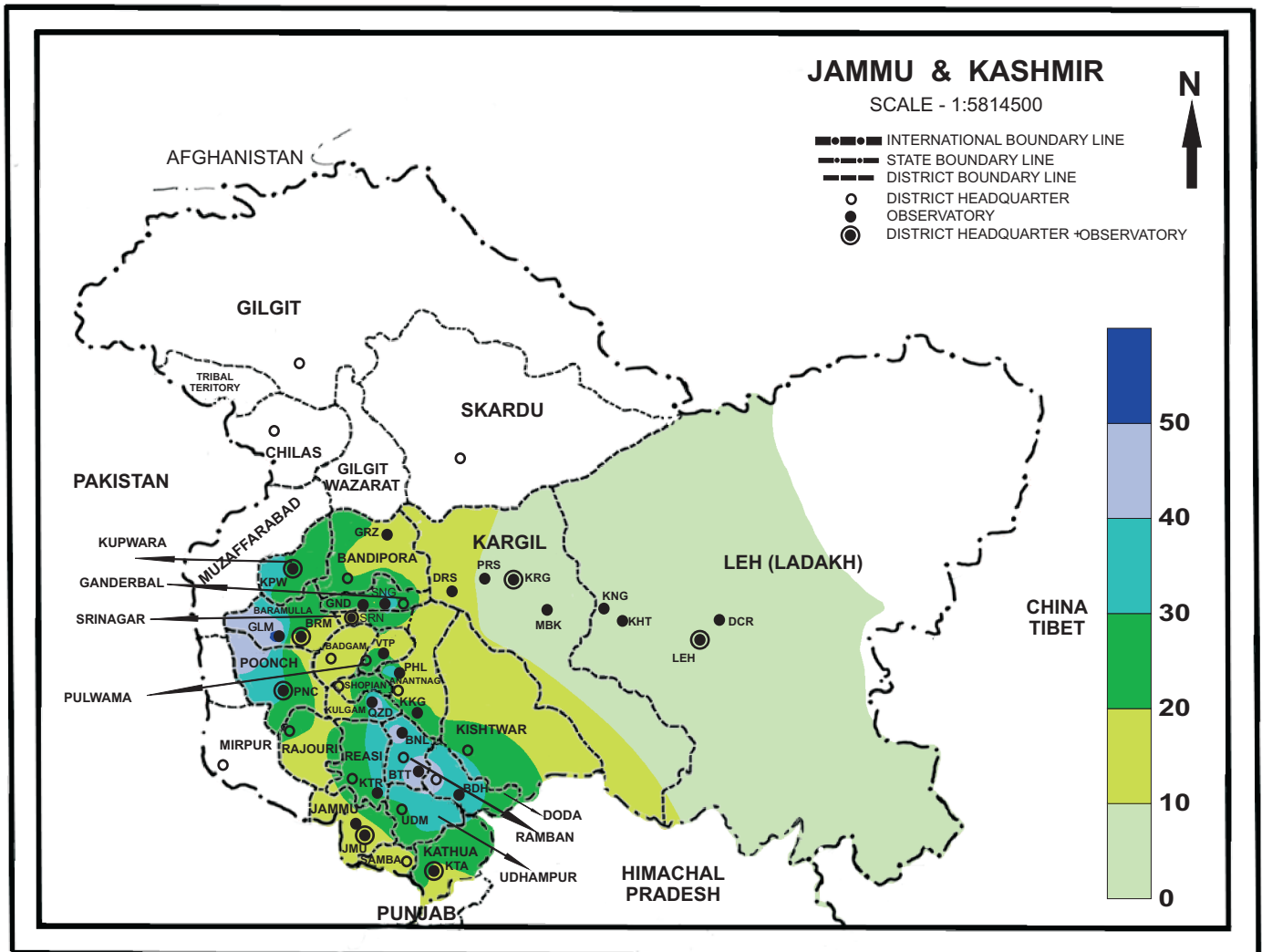
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FIG: 6 : ANNUAL NORMAL RAINFALL (cm)



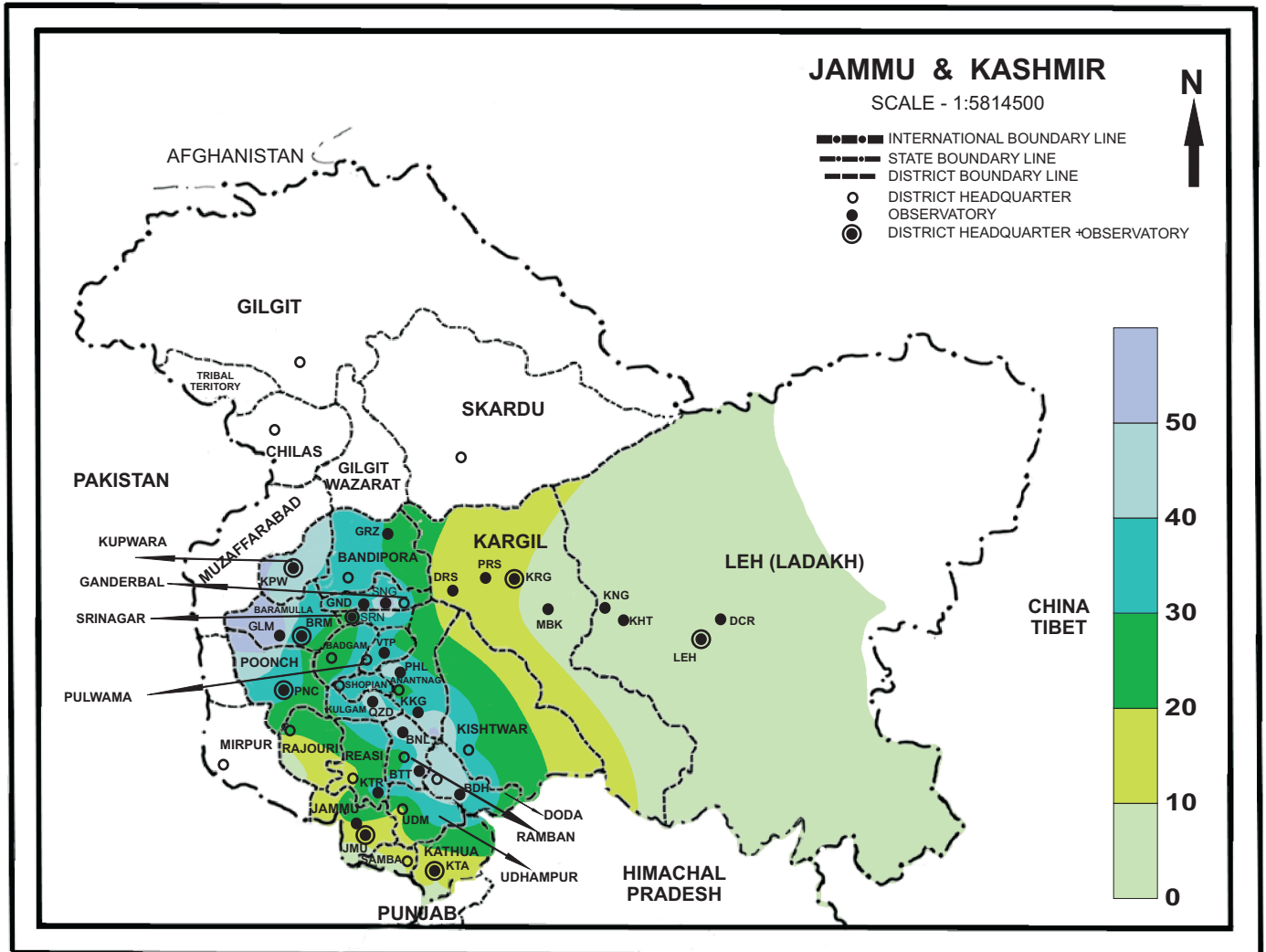
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FIG: 6(a) : SEASONAL RAINFALL (cm) - WINTER (COLD WEATHER) SEASON - DEC-JAN-FEB



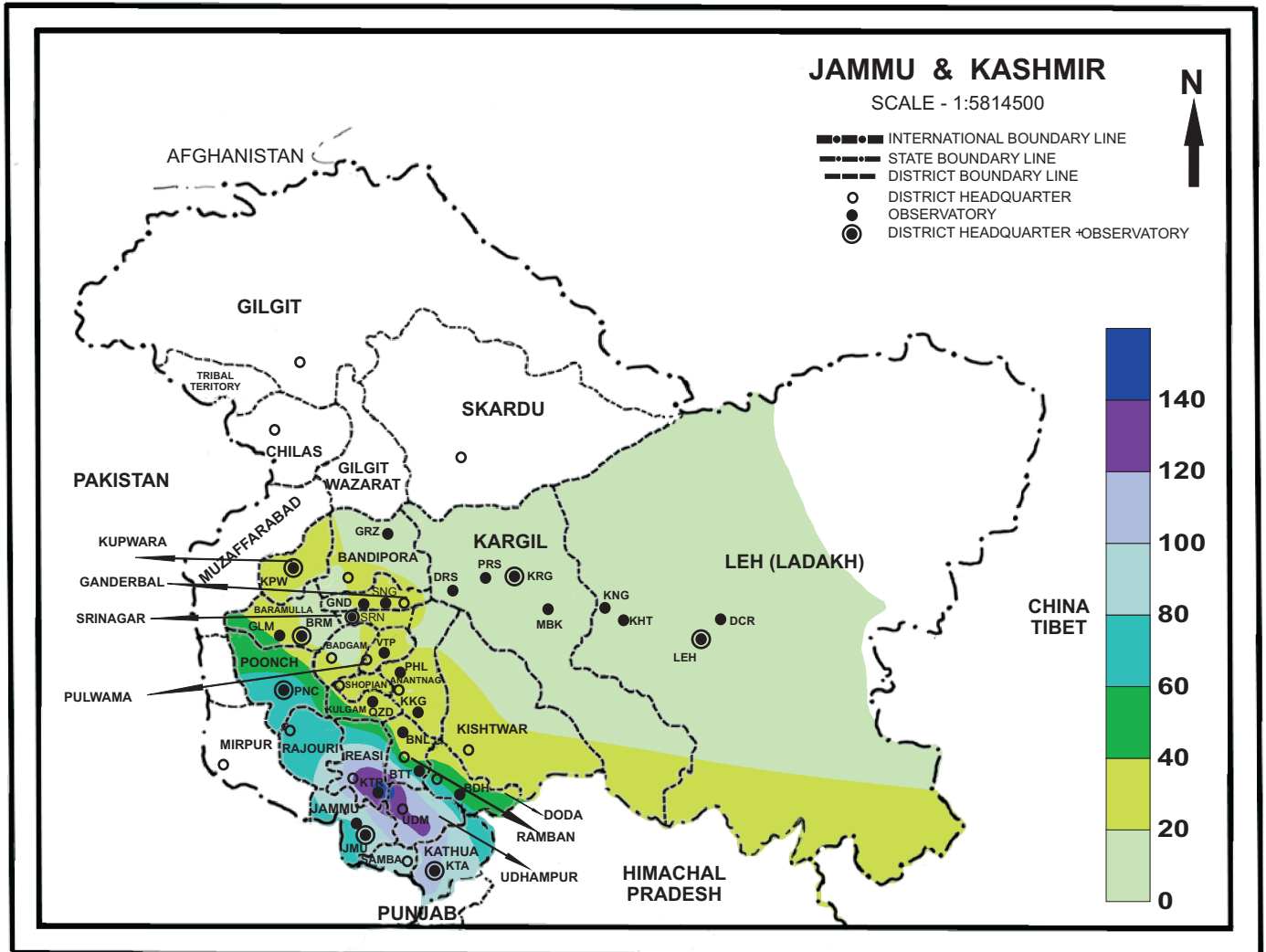
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FIG: 6(b) : SEASONAL RAINFALL (cm)- PRE-MONSOON (HOT WEATHER) SEASON-MARCH-MAY



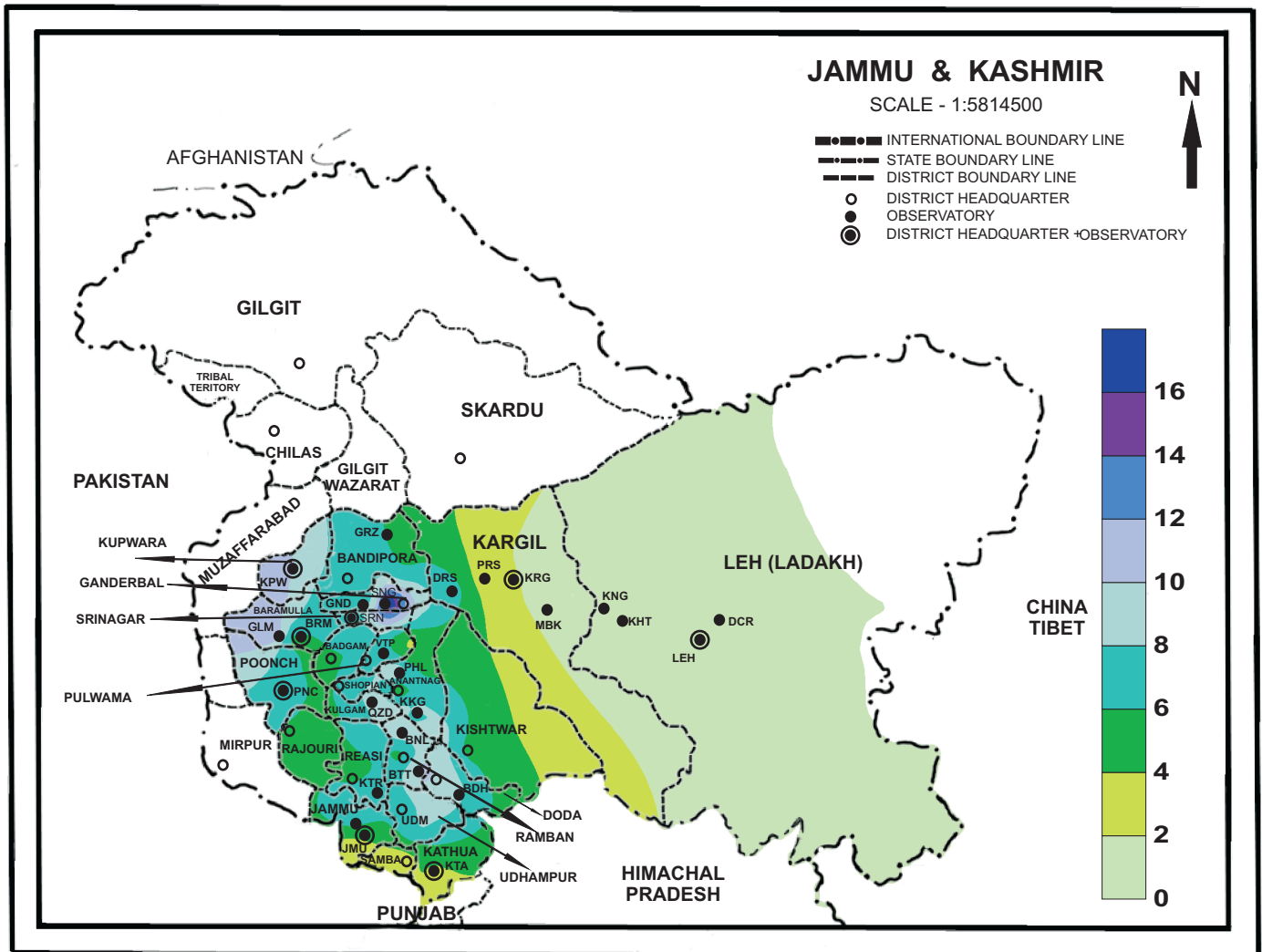
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FIG: 6(c) : SEASONAL RAINFALL (cm) - SOUTHWEST MONSOON SEASON - JUNE - SEPTEMBER



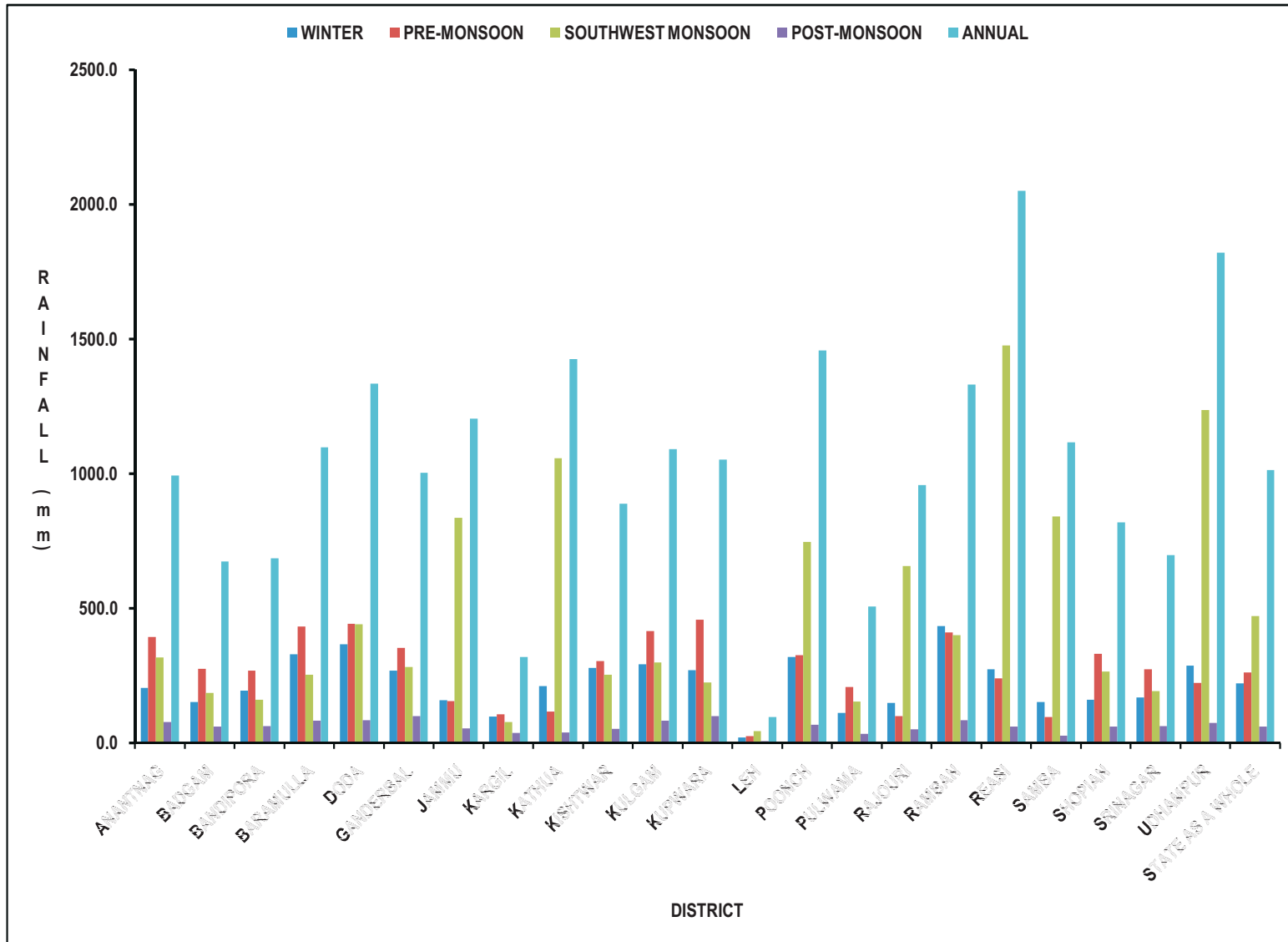
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FIG: 6(d) : SEASONAL RAINFALL (cm) - POST MONSOON SEASON - OCTOBER-NOVEMBER

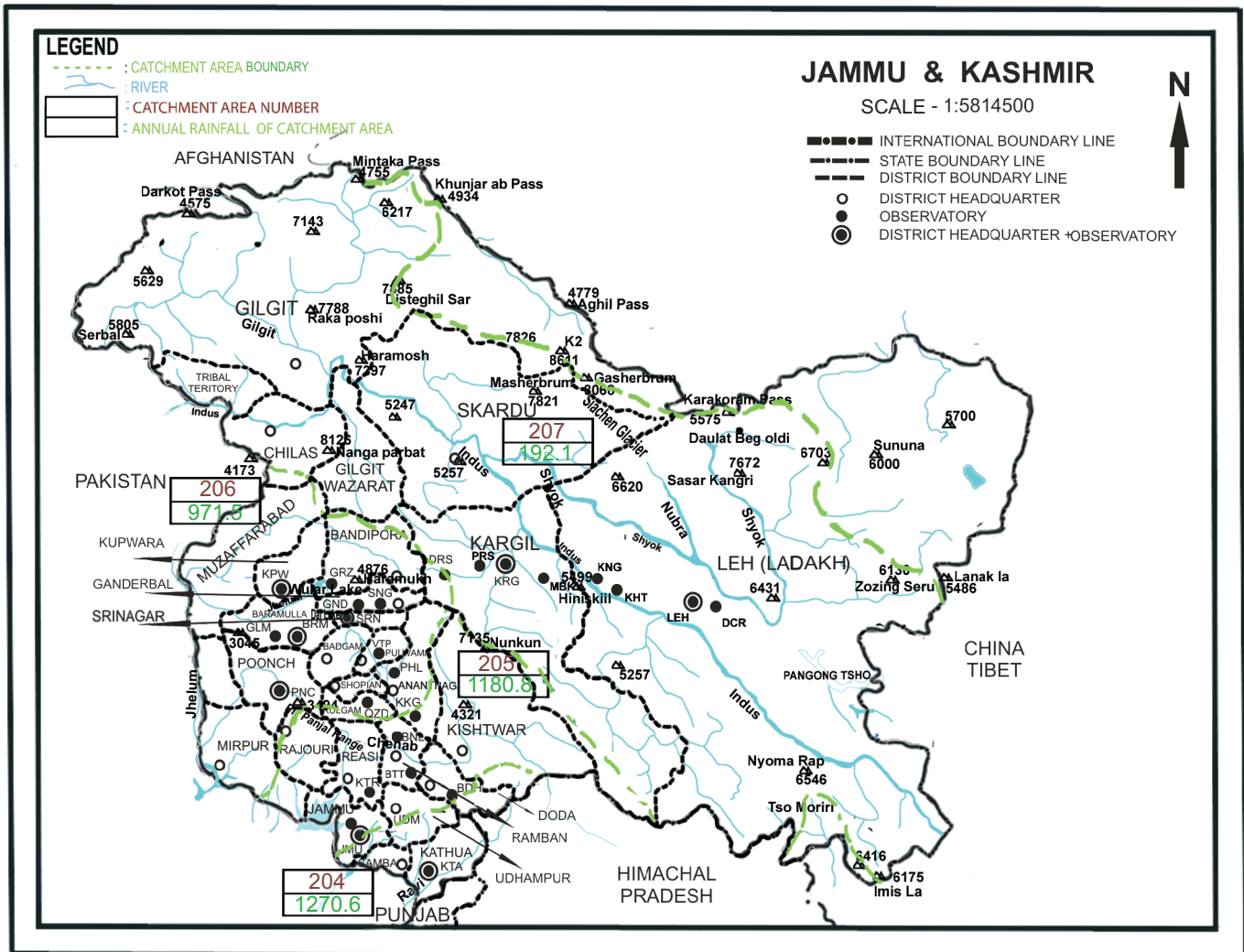


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FIG: 7 : DISTRICT NORMALS OF SEASONAL AND ANNUAL RAINFALL (mm)
JAMMU AND KASHMIR

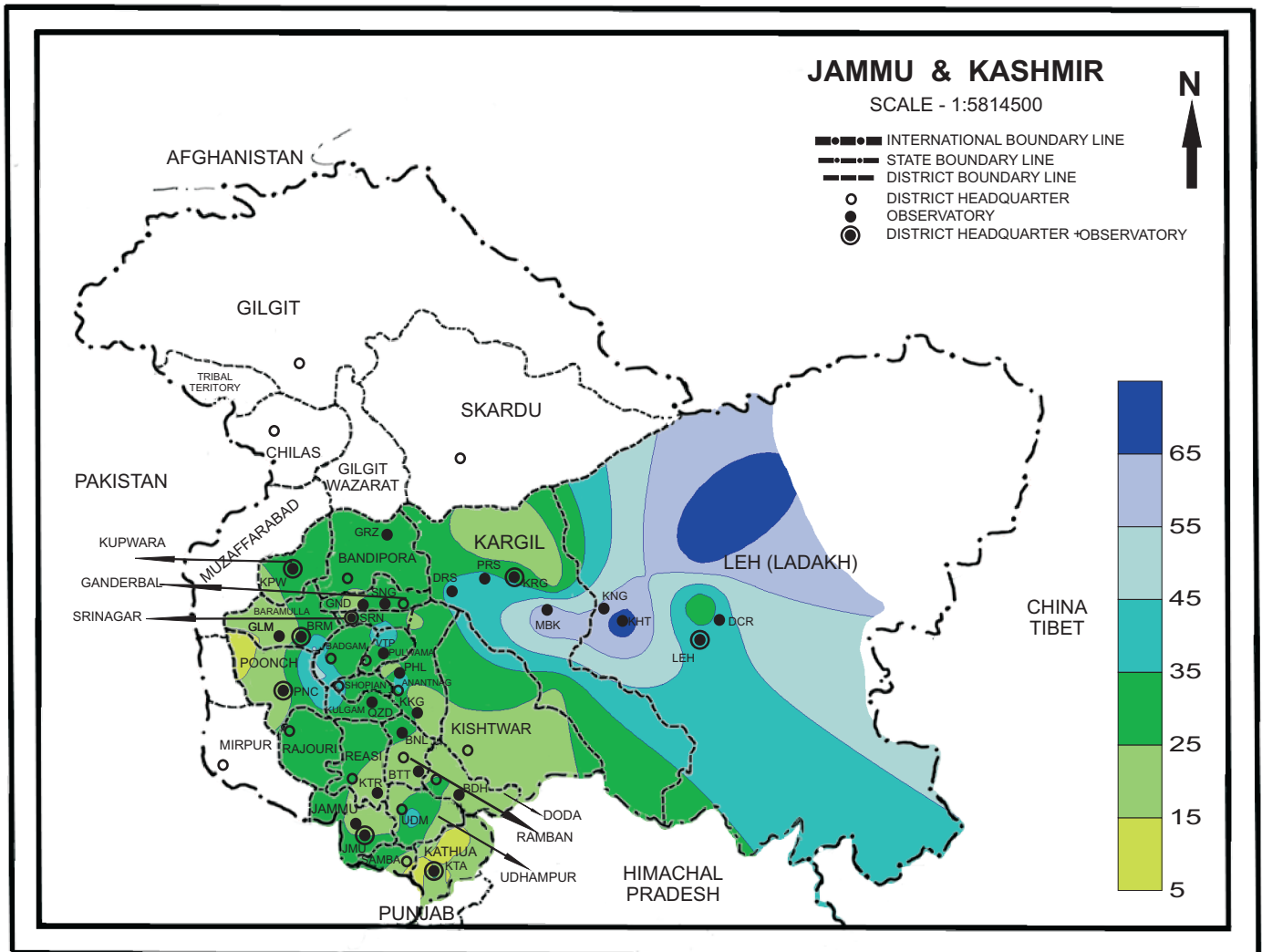


**FIG : 8 : CATCHMENT AREAS WITH ANNUAL RAINFALL (mm)
(204, 205,206,207)**



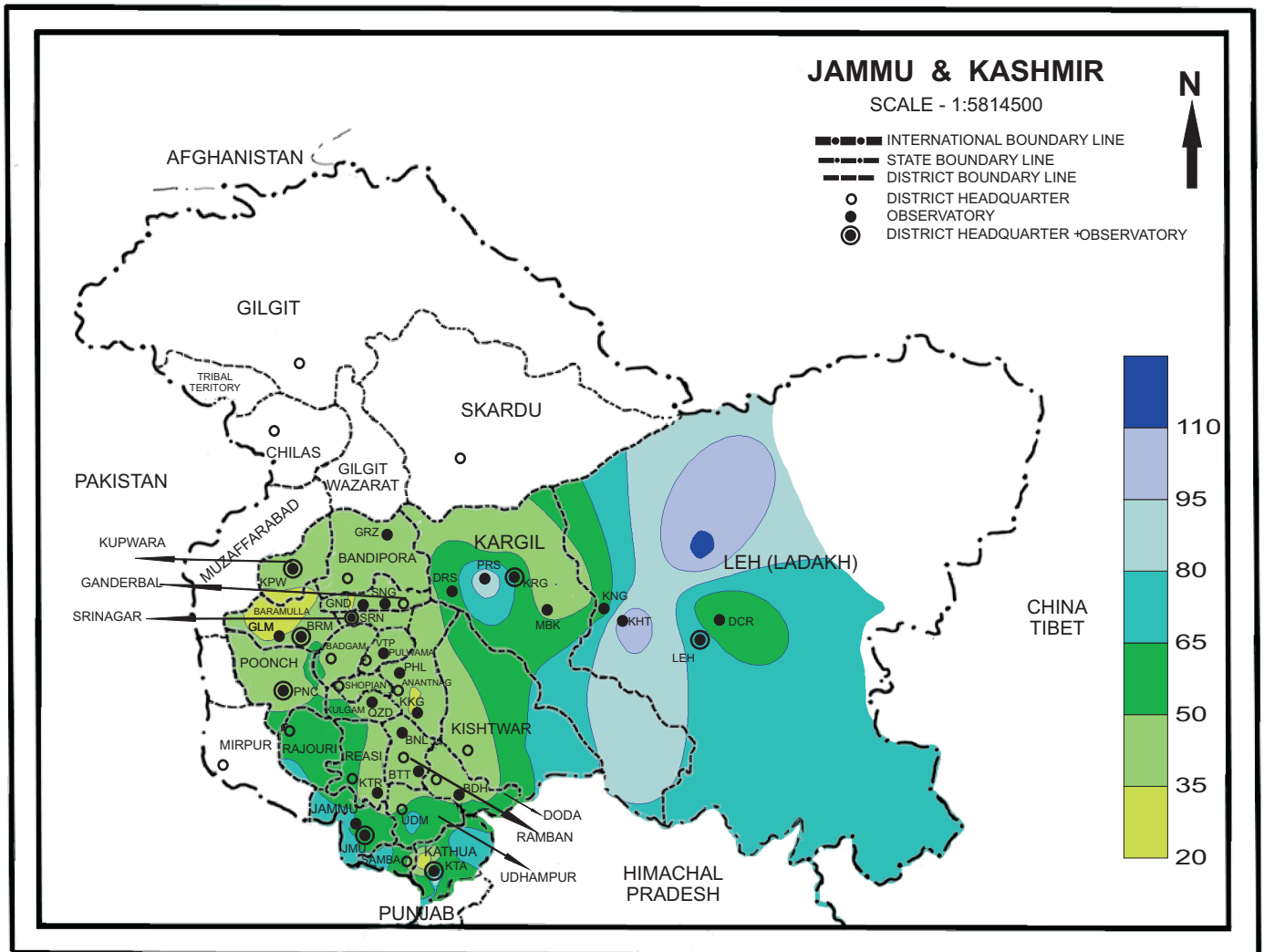
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FIG: 9 : COEFFICIENT OF RAINFALL VARIATION - ANNUAL



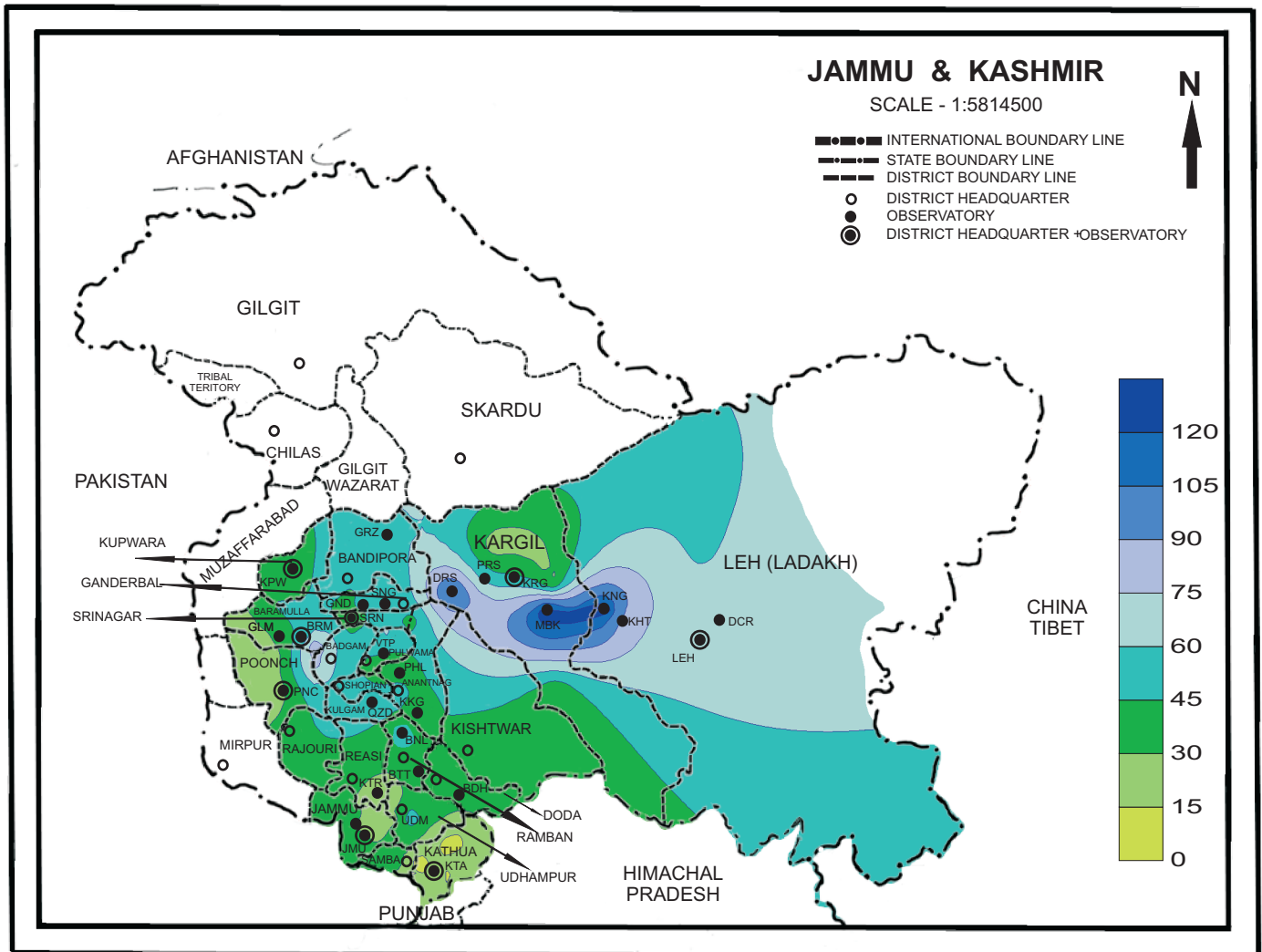
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FIG.9(a) : COEFFICIENT OF RAINFALL VARIATION PRE-MONSOON SEASON (MARCH-MAY)



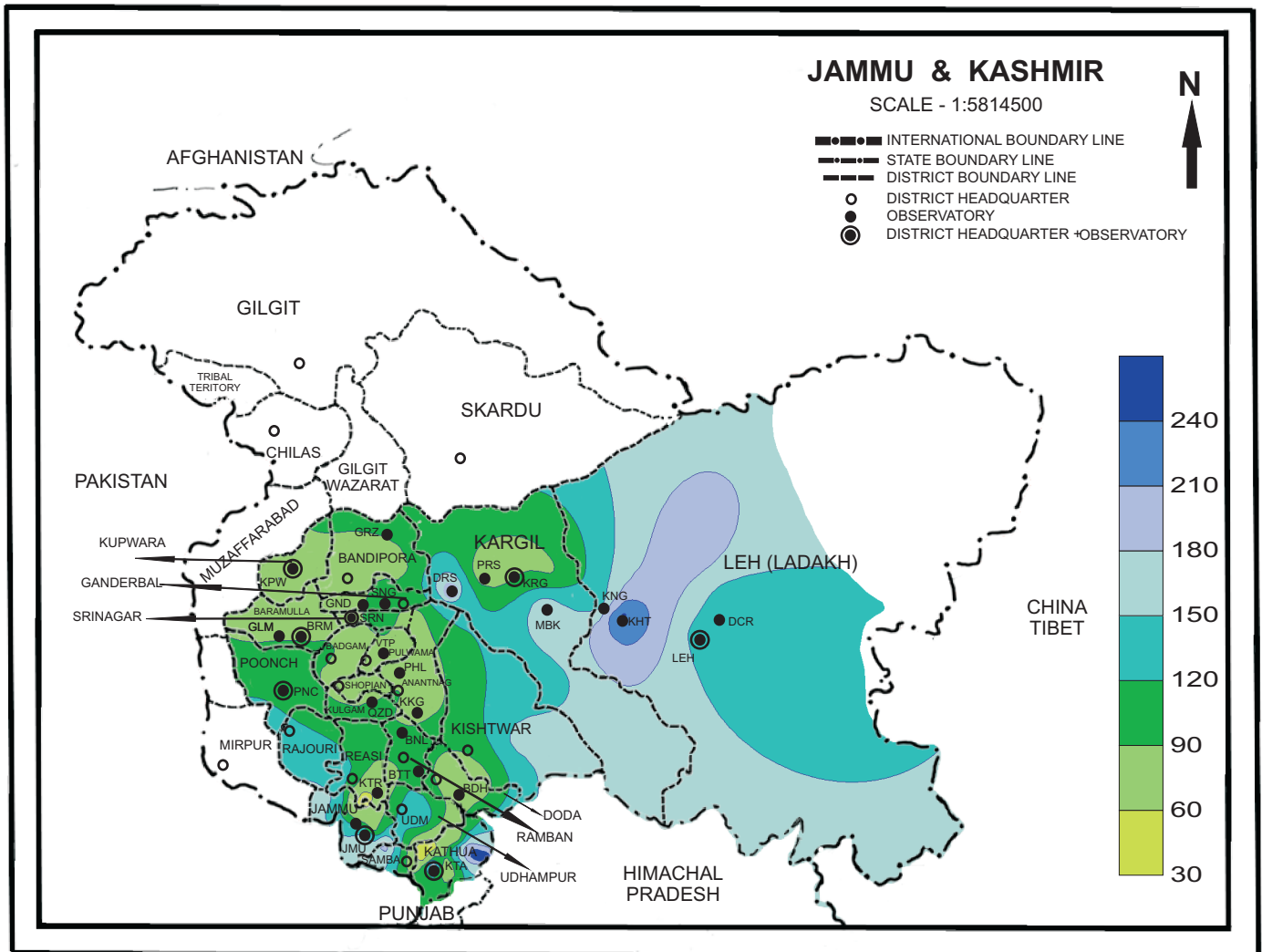
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FIG :9(b) :COEFFICIENT OF RAINFLL VARIATION - SOUTH WEST MONSOON SEASON (JUNE-SEPTEMBER)



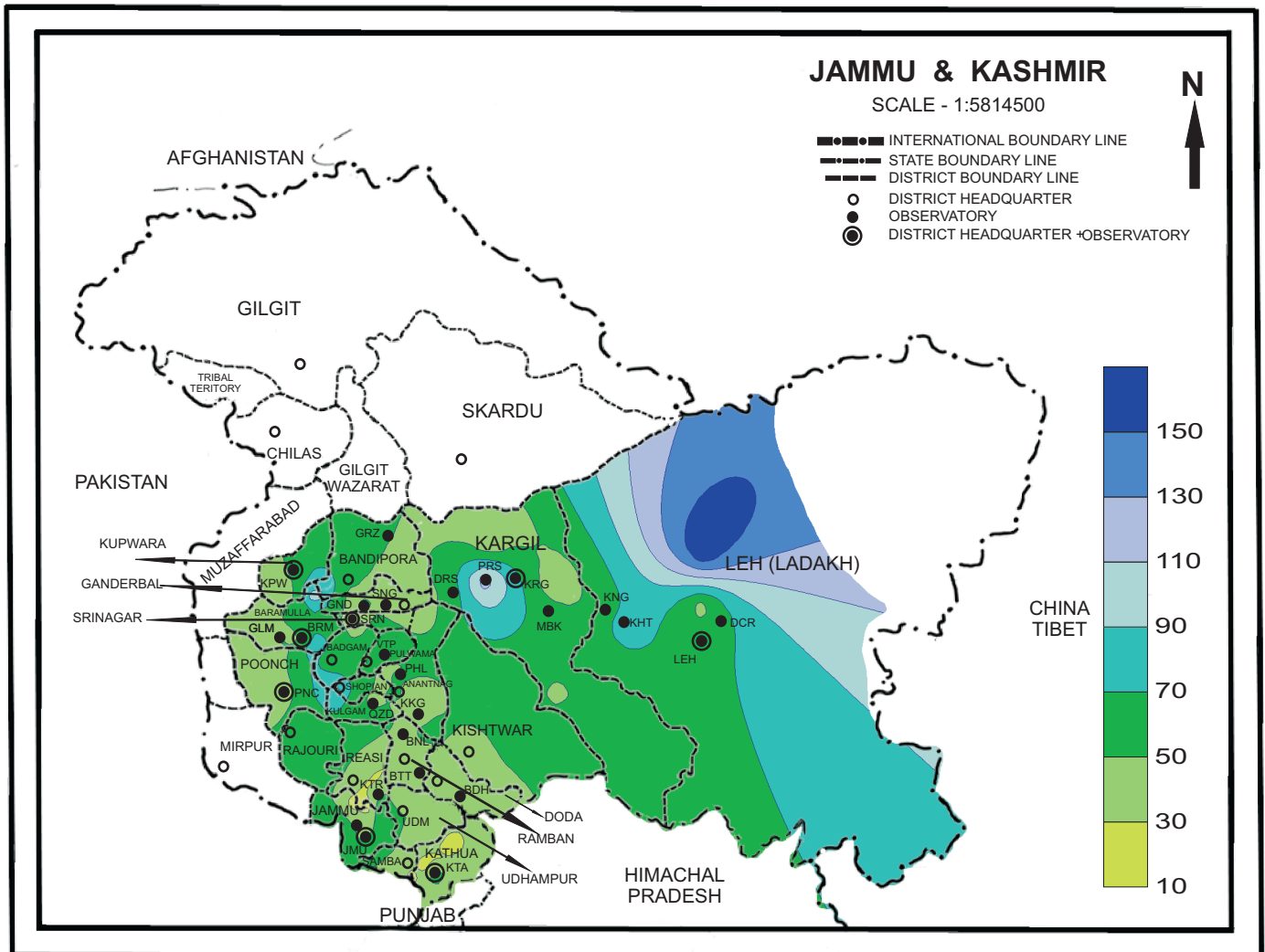
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FIG : 9(c) : COEFFICIENT OF RAINFALL VARIATION - POST MONSOON SEASON (OCTOBER-NOVEMBER)



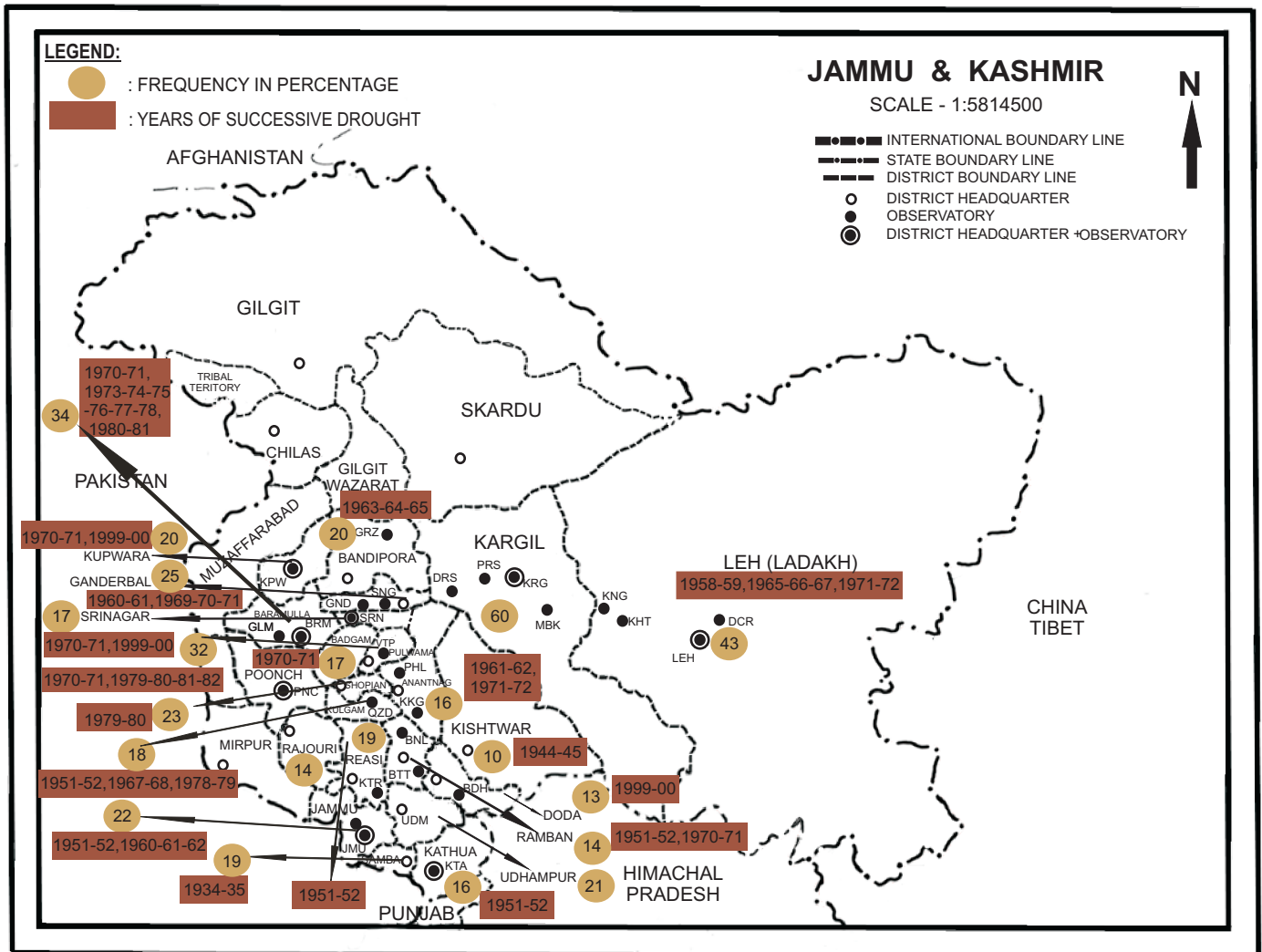
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**FIG: 9(d) : COEFFICIENT OF RAINFALL VARIATION - WINTER SEASON
(DECEMBER-JANUARY-FEBRUARY)**



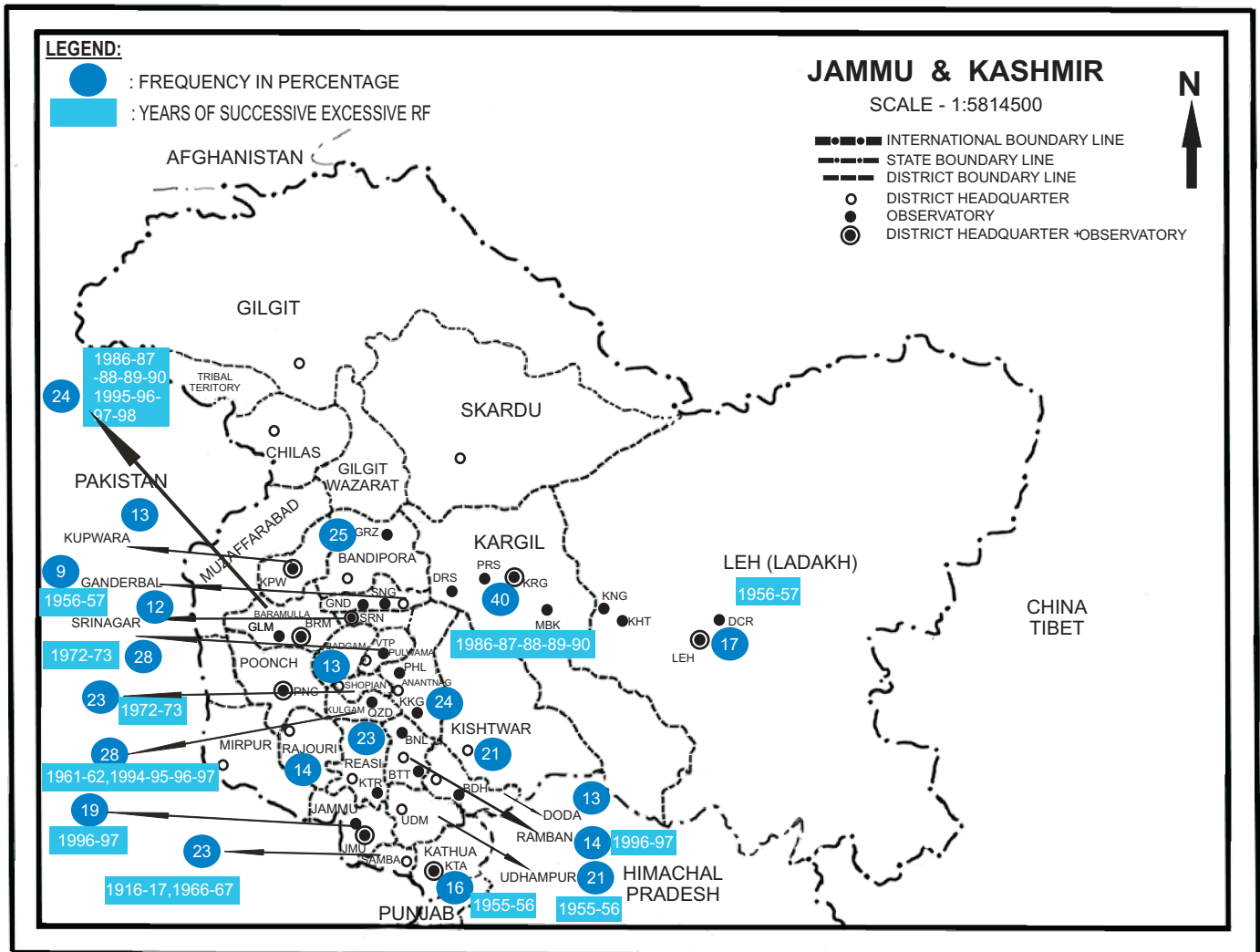
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**FIG:10 :AREA AFFECTED BY DROUGHT
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**FIG: 11 :AREA AFFECTED BY EXCESSIVE RAINFALL
JAMMU & KASHMIR**



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**STATE SUMMARY OF
JAMMU & KASHMIR**

CLIMATE OF JAMMU AND KASHMIR

Introduction

The state of Jammu and Kashmir lies in the western Himalaya. It is India's northernmost state, covering an area of 2,22,236 sq. km. It lies between Latitude 32°17'N and 37°05'N and longitude 72°31'E and 80°20'E. The state is bounded on the north by Afghanistan and China, on the east by China, on the south by Himachal Pradesh and Punjab states in India and on the west by Pakistan.

The state has a large variation in its own topography. It has hilly terrain with high mountains and a number of valleys in all regions except extreme southwestern part where lying plain area of low elevation. Topographically the whole region is almost mountainous with four main ranges of Himalayas; Karakoram, Zaskar, Ladakh and Pir Panjal. Karakoram and Kyunlun ranges lie to the north and northeast of the state and separate it from Russian, Turkistan and Tibet. Karakoram range where K2 peak height 8611 metres above mean sea level, the second highest peak of the world is situated. Two lofty peaks of Gashorbram (8570 m) and Masharbram (7827 m) also lie in this range. There are many mountain peaks in Karakoram range which are having height above 5000 m. Zaskar range separates the Indus valley from Kashmir valley. It is part of the Tethys Himalaya and is approximately 100 km wide. The peak height of Zaskar range is about 6,000 m. Ladakh range lies to the north of Leh and it is an important part of the Trans-Himalayan range that merges with the Kailash range in Tibet. In the Ladakh region the peak height is about 7672 m and there are many peaks above 5000 m. The Pir Panjal range lies to the south of the main Himalayas which has peak height about 4100 m and it follows from Gulmarg in the northwest to southern rim of the Kashmir valley and Banihal pass. Mountains have a geographical importance to climatic conditions of the state.

Presently, Jammu & Kashmir state under the control of Indian government has area about 101,437 sq. km vide geographically three distinct regions - Jammu, Kashmir valley and Ladakh.

The Jammu region comprises of plains, foothills and forested mountains. The plains of Jammu are an extension of the great north Indian plains rising from Punjab and extending towards the Shivalik ranges. The Shivalik hill is a mountain range of the outer Himalaya which merges into Pir Panjal range. The Pir Panjal range separates the Jammu region from Kashmir valley.

Kashmir valley is situated between Pir Panjal range and Zaskar range and is covered by forested mountains, lakes, waterways and terraced fields. The valley region is generally bounded on all sides by mountains. Average height of the valley is 1615 m but the surrounding mountains with snow-clad rise from 3000 to 4900 m. The surface of the valley is mostly plain and abounds with springs and lakes.

Ladakh region accounts for nearly two-third of the state's area and is a high altitudinal snow covered deserted region having elevation up to 7672 m. The Ladakh is one of the highest areas on earth which has an average altitude being above 3650 m.

There are a large number of rivers which originate from high mountains and flow throughout the year in the state. Indus, Jhelum and Chenab are the longest rivers in the state. There are some major rivers which flow through the state:

Indus river: It originates from the Mansarovar lake in Tibet. It starts its itinerary at the meeting point of the Gar and Sengge rivers and penetrates the famous mountain range in southeast Ladakh, close to its meeting point with the Gurtang river where altitude of the meeting point is about 4,200 m. Subsequently, Indus river traverses by north and northwest in the middle of Zaskar mountain range and lofty Ladakh mountain range to the north. The

overall length of the river is 3,180 km and a considerable portion of this river is to flow through the neighbouring countries. Shayok and Zaskar are tributaries of Indus river.

Jhelum river: It originates from Verinag spring situated about 80 km south-east of Srinagar at an altitude of 1890 m. It flows a distance of 25.6 km to Khanabal like a nullah. From that place a number of tributaries join the Jhelum and make it navigable from Khannabal to Wullar lake. Its total length in the Kashmir valley is 177 km. It flows in loops through the valley till it enters the Wullar; it flows out from its other side to Baramulla and it runs across the Jammu region and then it enters the boundary of Pakistan. It ultimately pours into Indus river.

Tawi river: It originates near Kaplas mountain and flows westward between Jug Dhar and Trisul Dhar in a westerly direction till Udampur where it takes a southerly bend across the Shivalik range and again resumes a westerly course passing along the Jammu city till it joins Chenab river in Sialkot district of Pakistan.

Chenab river: This river is formed by the confluence of two rivers -Chandra and Bhaga rising in Lahoul and confluencing at Tandi (Himachal Pradesh). Chenab river is famously called as Chandrabhaga. It enters in to the state at Padar after flowing through the Pangli valley of Chamba (H.P.). The river has many gorges, rapids and falls during its flow from Tandi to Kishtwar. After confluencing with its tributary Wadwan stream at Kishtwar forms typical gorge about 300 m below Kishtwar valley. Chenab flows to the west from Kishtwar crossing Doda, Ramban and Reasi to Akhnoor. It crosses Indo-Pak border at some distance from Akhnoor.

Ravi river: It originates from the Himalaya at Bara Bhangal near Rohtang Pass in Himachal Pradesh. It flows through Pir Panjal and Dhauladhar range on its south and north respectively. It passes close to Kathua and through Madhopur and enters in to plains of Punjab. It is one of the six streams of

India's river system in Punjab. It runs across the eastern parts of Pakistan and northwestern areas of India.

There are many lakes in the state which are source of water.

Wullar lake: It is the largest fresh water lake in India. It is about 16 km long and 9.6 km wide with ill-defined shores. This lake lies between Bandipora and Sopore at a distance of 75 km from Srinagar. Jhelum river enters in to this lake from the southeast and leaves it from the west. Storms rise in the lake everyday in the afternoon. Many small streams- Harbuji, Aarah, Erin and Pohru join this lake.

Dal lake: It is a beautiful lake near Srinagar. It is 8 km long and 6.4 km wide. It is the flood-lung of the Jhelum. The famous Mughal gardens are situated around it. The lake is an ideal place for swimming and sailing by Shikaras or house boats and motorboats. Floating gardens are found in this lake where a large variety of vegetables are grown. The Dal lake has two parts - small Dal and big Dal, separated by a swampy bund. There are two artificial islands in the lake; Rupalank and Sonalank built by Mughal Emperors. Nehru park is the western terminus of the lake.

Anchar lake: It is a swampy area. It is about 8 km long and 3 km wide. Sind nullah enters this lake from one side and flows out from the other. Ganderbal is a famous township on its northwest bank.

Mansbal lake: It is at a distance of 29 km from Srinagar and is situated at Safapore (Ganderbal). It is 5 km long and 1 km wide. It is connected with the Jhelum by a canal near Sumbal. Mughal emperors have built a summer palace on its bank of Mansbal lake.

The state has one meteorological sub-division (namely Jammu & Kashmir) of area about 101,437 sq km and it has 22 districts viz:

S. No.	Name	S. No.	Name
1.	Anantnag	12.	Kupwara
2.	Badgam	13.	Leh
3.	Bandipora	14.	Pulwama
4.	Baramulla	15.	Poonch
5.	Doda	16.	Rajouri
6.	Ganderbal	17.	Ramban
7.	Jammu	18.	Reasi
8.	Kargil	19.	Samba
9.	Kathua	20.	Shopian
10.	Kishtwar	21.	Srinagar
11.	Kulgam	22.	Udhampur

Climate

In general the year may be divided into four seasons. The winter season from December to February is followed by pre-monsoon or hot weather season from March to May. June to September constitutes the southwest monsoon season and the period of October and November is of post monsoon season.

Topographically the state is divided in to three regions like- Jammu, Kashmir valley and Ladakh. Broadly the state has three distinct climatic regions viz., arctic cold desert areas of Ladakh, temperate Kashmir valley and subtropical region of Jammu.

Jammu region has plains, valleys, hills and mountains of Pir Panjal and Shivalik ranges, comprising the districts of Kathua, Jammu, Samba, Udhampur, Reasi, Doda, Ramban, Kishtwar, Rajouri and Poonch. The climate of Jammu varies greatly owing to its rugged topography. The southern part of the state has a typical monsoon tropical climate. In summer, the southern part is very hot and maximum temperature reaches above 45°C. January is the coldest month when minimum temperatures go down to freezing point, while

in July and August, very heavy and erratic rainfall occurs. The climatic conditions vary as the region has topographic variation.

Kashmir Valley region (Vale of Kashmir) is situated between Pir Panjal and western end of great Himalayan ranges, which stop monsoon wind from southeast and south, and cold winds coming from central Asia. As such the climate of sheltered Valley of Kashmir has its own peculiarities and exhibits exception to peripheral region. The Kashmir valley comprises of Anantnag, Badgam, Bandipora, Kulgam, Shopian, Pulwama, Srinagar, Ganderbal, Baramulla and Kupwara districts. The valley experiences a temperate climate. Summers are pleasant but winters are very cold and there is snowfall. It rains from the middle of March to mid-May in the valley. Lofty mountains like Pir Panjal, Zaskar and Karakoram check winds from the surrounding regions. The monsoon winds in summer cause rain in the outer plains and outer hills. But the winds can cross the Pir Panjal range only when they are strong. In winter winds from the Mediterranean cause snow and rain in the valleys of Kashmir. Snow falls on the mountains surrounded the valley. The climate found in the zone of the mid-mountains and valleys is of a particular type. Topography of the region is considered to determine the degree of coolness, the form of precipitation and summer temperature. Winter from November to March is cold which is of a long duration. During these months strong winds bring snow and rain from the Mediterranean depressions/low. In higher mountains round the valley of Kashmir, winter is very cold with moderate and heavy snowfall. Summers from mid-March to June are mild and of a very short duration and it rains. Weather in the valley region is generally pleasant during April to June. In monsoon season, there is occurrence of rainfall when the monsoon winds are strong.

Ladakh region comprises of two districts Leh and Kargil. This region lies on the rain shadow side of Himalaya having high elevated areas. Ladakh experiences extreme climatic conditions due to its high altitude. Greater Himalayan range exposes the place to extreme winters. The Ladakh plateau is at an average altitude of 3650 metres above mean sea level, where the minimum temperatures are around -20°C to -40°C in the months of

December to February. Sometimes the temperature is experienced below -40°C at the places of peak height. The barren locations of Ladakh are also very dry with the relative humidity ranging from 25% to 50% and hot in the months of April to October. Being on the leeward side of the Himalayan ranges this region hardly gets any rainfall which is only around 100 mm. The region combines the conditions of both the arctic and the desert climate. Therefore, Ladakh is often called a "**COLD DESERT**".

Areas in the state under each climate pattern based on Koppen's classification are shown in Fig.2. This broad classification is based on annual and monthly means of precipitation in cm and temperature in $^{\circ}\text{C}$.

Kathua and Udhampur districts and some parts of Anantnag, Bandipora, Baramulla, Kupwara, Ramban, Shopian and Srinagar districts come under the climate type- Interior Mediterranean, mild winter, dry and hot summer (Csa). Jammu and Samba districts and some parts of Poonch, Reasi and Rajouri districts come under the climate type - subtropical monsoon, mild and dry winter, hot summer (Cwa). Some part of Doda, Ganderbal, Kishtwar, Kulgam, Pulwama and Ramban districts come under the climate type - humid subtropical, mild winter, moist all seasons, long hot summer (Cfa). Some elevated area of Ramban district comes under the climate type -Marine, mild winter, moist all seasons, warm summer (Cfb).

High altitudinal (peaks) area of Rajouri and Reasi districts comes under the climate type - Tropical upland, mild winter, dry winter, short warm summer (Cwb). Badgam district and some high altitudinal areas of Anantnag, Baramulla, Bandipora Ganderbal, Kupwara, Kulgam, Poonch, Pulwama, Shopian and Srinagar districts come under the climate type - Humid continental, severe winter, moist all seasons, short warm summer (Dfb). High altitudinal areas of Kishtwar, Kargil and Leh districts come under the climate type - mid-latitude desert arid cool or cold (BWk).High altitudinal(peaks) areas of Anantnag, Bandipora, Baramulla, Doda, Kargil, Kishtwar and Leh districts come under the climate type – Tundra and very short summer(ET).

Sea Level Pressure and Winds

The seasonal variation in atmospheric pressure over the state occurs in a systematic way with a maximum in the winter and minimum in the southwest monsoon season. The pressure gradient over the state is strong during winter and southwest monsoon season. The pressure increases from southwest to northeast during April. The winds which are light and mainly from north direction in January and turn gradually anti-clockwise and are replaced by light winds from northwest to southwest direction in April. With the advance of the summer, the pressure gradient increases over the state.

Winds are generally variable as the state has mostly hilly terrain with lofty mountains and valleys. With the progress of the monsoon, southwesterly and westerly components of the wind become increasingly predominant. October onwards, the change over of the pressure to winter pattern commences but wind pattern slightly changes as sometimes northerly and easterly components are seen. Table I gives the monthly mean wind speed in kilometer per hour and predominant wind direction in the morning and evening for observatory stations in the state.

Temperature

Table II (a, b & c) gives the mean maximum and minimum temperature at the observatory stations for three regions. Figs. 2(a,b,c,d) and 3(a,b,c,d) show the distribution of mean maximum and mean minimum temperatures respectively for the selected months. Figs. 4 and 5 give the extremes temperatures ever-recorded based on the data up to 2010.

The temperature of the state ranges from the scorching heat of the plains of Jammu region to cool at the snow-capped heights of mountains and the mud peaks of Ladakh. The variations in temperatures in the state are due to its location and topography. Considering the topographic features, the distribution of temperatures in the state can be divided in to three regions-

Jammu (southwestern windward part of state), Kashmir valley and Ladakh region (Northeastern leeward part of state).

Jammu Region: Day temperatures are more or less uniform over the plains of Jammu which has an elevation of around 300 m, however, it reduces towards the east and north in the Shivalik hill ranges, which have elevations of about 1500 m showing the temperature up to 6 - 8⁰C less than that of the plains. The temperatures are much lower at high altitudinal areas. In general, the temperatures at night become lower especially in the high altitudinal areas.

January is the coldest month when mean minimum temperatures for the region as a whole is about 3⁰C, varying from -1.9⁰C in the northern high altitudinal areas to 7.8⁰C in the southern plains. While the mean maximum temperatures for the region as a whole is about 13⁰C, varying from 10⁰C at high altitudinal area in the northern to 19⁰C in the southern plains. A much lower temperature may be experienced in the wake of western disturbances during winter. On such occasions minimum temperature falls below the freezing point and are recorded at stations in the northern parts of Jammu region. The lowest minimum temperature on record at any individual station was -13.6⁰C at Banihal observatory on 12 December 1964.

The maximum temperature rises steadily from February onwards till June. June is the hottest month with the average maximum temperature about 33⁰C in this region and recording 3⁰C to 5⁰C lower temperatures at elevated places and 3⁰C to 5⁰C higher temperatures at places of low altitude in the plain. Sometimes heat waves are also experienced in some part of the state in latter part of the pre-monsoon season. The highest maximum temperature ever-recorded at any individual station in the plains is 47.4⁰C at Jammu on 31st May 1988, which is about 8⁰C higher than the normal of the warmest month.

The increase in maximum temperature in the period from February to June is about 17⁰C to 19⁰C at individual stations, whereas minimum

temperature rises by 14°C to 16°C from north to south of the region. With the onset of the monsoon in the end of June the maximum temperature decreases by about 2°C to 5°C from the beginning of July, whereas in the higher altitudinal areas fall in maximum temperature during this month is less than 1°C. The minimum temperature increases by 2° - 3 °C in the high altitudinal areas and falls only by about 1°C in the southern plains of Jammu. Both the temperatures may be 10 °C - 20 °C lower at the peaks of mountains.

Both the temperatures begin to fall rapidly after September while the day temperature follows this trend after October in the southern plains of Jammu and both attain the lowest values by January.

Kashmir Valley: January is the coldest month when the mean minimum temperature for the region as a whole is about -5 °C, varying from -2°C in the average altitudinal areas to -8°C high altitudinal areas in the surrounding mountains. While the mean maximum temperature for the region as a whole is about 5°C, varying from 6°C at average altitudinal areas to 1°C at high altitudinal areas in the surrounding mountains. A much lower temperature is experienced in the wake of western disturbances during winter. On such occasions minimum temperature significantly falls below the freezing point of water. The lowest minimum temperature on record at any individual station was -20.0°C at Srinagar observatory on 06 February 1895.

The maximum temperature rises steadily from March onwards till July. July is the hottest month with the mean maximum temperature in the valley of about 27°C, with recording of 2°C to 3°C higher temperatures in the low altitudinal station and 2°C to 7°C lower temperatures at places of high altitude in the surrounding mountains. The increase in maximum temperature in the period from March to July is about 14°C to 17°C at individual station whereas the minimum temperature rises by 10° to 15°C at places in the surrounding mountains from March to July.

With the onset of the monsoon there is a little change in maximum temperature from the beginning of July, whereas the minimum temperature

increases by about 2°C to 4 °C. Both the temperatures may be 10 °C - 20 °C lower at the peaks of mountains.

Both the temperatures start to fall rapidly after August. The highest maximum temperature ever-recorded at any individual station in the valley of Kashmir is 38.3°C at Srinagar on 10th July 1946, which is about 8°C higher than the normal of the warmest month.

Ladakh Region: Due to topography this region is dry and cold. January is the coldest month when mean minimum temperature is about -14.4°C and mean maximum temperature is about -2°C in areas of height at 3500 m. The maximum temperature rises steadily from March onwards till August, which is the hottest month with the mean maximum temperature at 25.3°C and mean minimum temperature about 10°C. Both the temperatures may be 15°C – 20°C lower at high elevated areas with reference to Leh town.

Extreme maximum and minimum temperatures ever- recorded at Leh observatory are 34.8 °C on 29th June 1978 and -28.3 °C on 11th January 1899 respectively.

Humidity

Table III gives the mean relative humidity at 0830 and 1730 hours IST for observatory stations in the state. The state has three different regions according to its topography. In the Jammu region the relative humidity in the morning generally varies from 45% to 85%. The humidity is slightly less in the period April to June when it is about 45% to 65%. The humidity in the afternoon is slightly less than the mornings and they are ranging between 35% and 70%. The period of March to June is the driest part of the year when the humidity ranges between 35% and 60%.

In Kashmir valley, the humidity is generally more than that of Jammu region. In the morning it generally ranges between 60% and 90% and in the afternoon it ranges between 50% and 85%.

Ladakh region lies in the eastern part of the state. It is the driest part of the state where the humidity is generally less throughout the year and ranges between 25% and 50%. From May to October it ranges between 25% and 40% and making this period very hot and dry. Diurnal variation of humidity is generally less throughout the year.

Cloudiness

Table IV and IV (a) give the mean monthly and total cloud amount and mean number of days with clear and overcast skies at 0830 and 1730 hours IST respectively for observatory stations in the state.

The skies over Jammu region are heavily clouded during December to May and July to August, whereas cloudiness over Kashmir region is heavy during December to April and moderate in July and August. While the cloudiness over Ladakh region is moderate during this period and it is less than other regions. The period from September to November is generally lightly clouded. Afternoons are however, comparatively more clouded than forenoons.

Rainfall

Table V gives districtwise and statewise mean monthly and annual rainfall and number of rainy days (i.e. days with rainfall of 2.5 mm or more). Fig. 6 and 6(a) to 6(d) depict the spatial distribution of the annual and seasonal rainfall over the state.

The total annual precipitation for the state as a whole is about 103 cm and total annual number of rainy days are about 59 (Table V). The precipitation in the state occurs in the form of rain and snow. Snowfall occurs mostly in winter months from November to March associated with western disturbances. January and February are the months with the heaviest snowfall. The annual rainfall varies from region to region with large variation

due to topographic variation in the state. The annual rainfall is more in Jammu region and less in Ladakh region. Reasi district in Jammu division receives the maximum amount of precipitation i.e. 205 cm in a year, whereas Leh district in Ladakh region receives the minimum amount of precipitation i.e. 10 cm only in a year.

Fig. 6(a) and 6(b) show rainfall pattern during winter (December to February) and pre-monsoon season (March to May) respectively. The rainfall over the state increases from east (Ladakh region) and southern plain of Jammu region towards Kashmir valley and neighbouring hilly part of Jammu region during winter and pre-monsoon season. The pattern of spatial distribution of the rainfall over the northeastern Ladakh, Kashmir valley and neighbouring hilly part of Jammu region of the state during pre-monsoon and winter seasons viz. Figs. 6(a) and 6(b) generally resembles to that of the spatial distribution of the annual rainfall (Fig. 6). In above cases rainfall is the maximum in northwestern and southern parts of Kashmir valley and neighbouring hilly part of Jammu region. From Fig. 6(c), it is observed that during the southwest monsoon season, the rainfall increases towards the southwest region. The pattern of spatial distribution of the rainfall over the Jammu region (windward side) during southwest monsoon season viz. Fig.6(c)) generally resembles to that of the spatial distribution of the annual rainfall (Fig. 6). From Fig. 6(d) it is observed that during post monsoon season rainfall increases from west to east in Jammu region and Kashmir valley and decreases eastward in Ladakh region.

In southwest part of Jammu region, the climate is of tropical monsoon. This area receives rainfall mostly in the southwest monsoon season (June to September). The districts of Jammu, Kathua, Poonch, Rajouri, Reasi, Samba and Udhampur in this region receive 68% of the annual rainfall in the southwest monsoon season while the winter, pre-monsoon and post monsoon seasons contribute 15%, 13% and 4% respectively to the annual rainfall. The northern and northeastern parts of Jammu region which have climate like Kashmir Valley i.e. snowfall and severe winter. Doda, Ramban and Kishtwar

districts receive maximum rainfall in winter and pre-monsoon months. In Jammu region total annual rainfall is about 136 cm.

Kashmir valley comprising of Anantnag, Badgam, Bandipora, Baramulla, Ganderbal, Kulgam, Kupwara, Pulwama, Shopian and Srinagar districts receives heavy rain and snow in winter and pre-monsoon months under the influence of frequent western disturbances from Mediterranean sea. In this area pre-monsoon season contributes maximum rainfall 40% to the annual while southwest monsoon, post-monsoon and winter seasons contribute 27%, 8% and 25% rainfall respectively to the annual rainfall respectively. The total annual rainfall of Kashmir valley is about 86 cm.

Ladakh region consists of only three districts Kargil, Kishtwar and Leh. The region except extreme southwest part of Kishtwar district is the driest part of the state. Leh and Kargil districts receive less rain i.e. 21 cm in a year. In this region pre-monsoon, southwest monsoon, post monsoon and winter seasons contribute 32%, 29%, 10% and 29% rainfall respectively to the annual rainfall.

The monsoon current generally remains weak over the state. It generally picks up strength only during the passage of westerly systems moving across the northern parts. The southwest monsoon sets in over the state by about the end of June and covers the entire state by about 1st July. The monsoon withdraws from the state by about 15 September.

The most common rain giving system over the state is western disturbances formed over the Mediterranean sea, Black sea and Caspian sea. Due to these western disturbances the state receives heavy rainfall and snowfall in winter and pre-monsoon season. Cyclonic circulations and depressions originating in the Bay of Bengal also bring rain during southwest monsoon season and occasionally flood comes in some areas of the state due to heavy rain. A good amount of rainfall is also received in the pre-monsoon months due to thunderstorms and hailstorms developed with intense convective activity and cyclonic circulation with adequate moisture.

The features of rainfall described above are also evident from Fig. 7 which shows the annual and seasonal rainfall for the individual districts as well as for the state and provides a measure for comparison of seasonal rainfall with the annual for both districtwise and statewide rainfall.

Table VI gives the monthly and annual rainfall for various river catchments (No. 204, 205, 206 and 207) in the state. The annual rainfall of these river catchments is shown in Fig. 8. However, table VI shows the districts/parts of districts of Jammu and Kashmir state covered by these catchments. Catchment No. 204 formed by Ravi river which covers Kathua and Samba districts, and some area of Jammu, Udhampur and Doda districts receives the annual rainfall of 1270.6 mm with 48 rainy days. Catchment No. 205 formed by Chenab river which covers the districts Reasi, Ramban, Rajouri and Kishtwar, and parts of districts of Jammu, Doda, Anantnag, Kulgam and Udhampur receives an annual rainfall of 1180.8 mm with 61 rainy days. Catchment No. 206 formed by Jhelum river which covers the districts of Badgam, Bandipora, Baramulla, Kupwara, Poonch, Pulwama, Shopian, Srinagar and Ganderbal, and some area of Anantnag and Kulgam districts receives an annual rainfall of 971.5 mm with 68 rainy days. Catchment No.207 formed by Indus river which covers the districts of Kargil and Leh receives an annual rainfall of 192.1 mm with 18 rainy days.

Rainfall Variability

The spatial distribution of variation of annual rainfall over Jammu and Kashmir is depicted in Fig. 9. Coefficient of Variation (CV) which is expressed as percentage is defined as:

$$\text{C.V.} = \frac{\text{Standard deviation } (\sigma)}{\text{Normal (N)}} \times 100$$

It is observed from Fig. 9 that values of CV of annual rainfall range between 5% and 73% over the entire state of Jammu and Kashmir.

The spatial distribution of CV of seasonal rainfall over Jammu and Kashmir is shown in Fig. 9(a), 9(b), 9(c) and 9(d) for the seasons: pre-monsoon season (March to May), southwest monsoon season (June to September), post monsoon season (October and November) and winter season (December to February) respectively.

During the pre-monsoon season it is observed that values of CV range between 18% and 117% (Fig. 9(a)). The northeast region of Jammu and Kashmir (Leh) exhibits the highest variability with values of CV about 80% to 117%. The south western sector of Jammu region exhibits higher variability with values of CV 65% to 80%, while the remaining Jammu region and Kashmir Valley exhibit the least CV values ranging between 18% and 65%.

During the southwest monsoon season it is observed that values of rainfall variability CV range between 6% and 135% (Fig. 9(b)). The rainfall variability is the highest in northeast region of the state (some part of Leh and Kargil districts) with values exceeding 90%. In the remaining part of Ladakh and Kashmir valley the values of CV range between 45% and 90%. While Jammu region of the state has low CV values about 6% to 45%.

During the post monsoon season the values of CV range between 31% and 250% (Fig. 9(c)). The gradient of CV is quite steep. The regions of northeast (Leh and Kargil), southern and southwestern part of the Jammu region exhibit the higher variability values exceeding 150% and the highest values exceeding 180% are observed in southeastern Kathua and Leh districts of the state. The central part of state i.e. Kashmir Valley, hilly part of Jammu and northern part of Kargil exhibit the lowest values of CV ranging between 30% and 120%.

During the winter season the values of CV range between 16% and 169% (Fig. 9(d)). The extreme northeast region (Leh) exhibits the highest variability with values of CV about 110% to 169%. The most part of Kashmir Valley and Kargil district exhibit values of CV about 30% to 70%. Some

western part of Kashmir valley and central part of Kargil exhibit higher CV with its values ranging from 70% to 110%. The Jammu region of the state exhibits low value of CV of about 10% to 70%.

The variability of annual rainfall over the state ranges between 5% and 73% (Fig. 9). As the variability of annual rainfall and rainfall during the southwest monsoon and pre-monsoon seasons over Jammu and Kashmir is relatively low while as the variability of rainfall during the post monsoon season is very high with CV values exceeding 200% over some parts of the state. In general the contribution of rainfall during southwest monsoon and pre-monsoon seasons to the annual rainfall is a maximum over the state.

Droughts:

Meteorological drought over an area or a place may be defined as a situation when the annual rainfall over the area or place is less than 75% of the normal. It is classified as “Moderate drought” if the rainfall deficit is between 25% and 50% and “Severe drought” when it is more than 50%. Areas where frequency of drought as defined above is more than 20% of the years examined, such areas are classified as “drought areas” and areas having drought condition for more than 40% of the years under consideration represent “chronically drought affected areas”.

Baramulla, Pulwama, Ganderbal Shopian, Jammu, Udhampur, Bandipora and Kupwara districts in the state experienced 14, 8, 8, 4, 7, 3, 4 and 8 years of drought respectively out of the 41, 25, 32, 17, 32, 14, 20 and 40 years under consideration during the period 1951-2000, satisfying the criteria for “drought areas”.

There are two districts viz. Kargil and Leh in the state, which experienced 3 and 10 years of drought respectively out of 5 and 23 years under consideration during the period 1951 – 2000, satisfy the criteria for “chronically drought affected areas”.

Following districts of the state were affected by drought during some years of the period 1951-2000 or the other period (1901-2000). The details of year wise occurrence of drought over each district are given below. The figures within the brackets against each district indicate the number of occasions when these districts were affected by drought.

Anantnag (6), Badgam (4), Bandipora (4), Baramulla (14), Doda (2), Ganderbal (8), Jammu (7), Kargil (3), Kathua (10), Kishtwar(4), Kulgam (7), Kupwara (8), Leh (10), Pulwama (8), Rajouri (1), Ramban (5), Reasi (5), Samba (11), Shopian (4), Srinagar (7), Udhampur (3).

There is not a single occasion of drought condition observed in Poonch district during this period.

Occurrence of drought conditions in successive years is not frequent in the state. However, individual district have had successive years of drought. Severity of drought not only depends upon the order of the rainfall deficiency in a single year, but also on the continued occurrence of deficient rain in successive years, even though the deficiency in each successive year may not be as high as in a single year.

The following table (i) depicts districtwise years of successive drought during the period under consideration of 50 year period 1951-2000 or other period (1901-2000).

Table (i)

S. No.	Names of district affected (Data period under consideration)	Years of Drought	Years of successive Drought
1	Anantnag (1951 – 2000)	1961, 1962, 1970, 1971, 1980, 2000.	1961 - 1962, 1970 - 1971.
2	Badgam (1959 – 2000)	1962, 1970, 1971, 1974.	1970 - 1971.
3	Bandipora (1951 – 1994)	1963, 1964, 1965, 1977.	1963 - 1964 - 1965.
4	Baramulla (1951 – 2000)	1955, 1960, 1962, 1968, 1970, 1971, 1973, 1974, 1975, 1976, 1977, 1978, 1980, 1981.	1970 – 1971, 1973 - 1974 – 1975 - 1976 - 1977 - 1978, 1980 -1981.

Table (i)

S. No.	Names of district affected (Data period under consideration)	Years of Drought	Years of successive Drought
5	Doda (1960 – 2000)	1999, 2000.	1999 - 2000.
6	Ganderbal (1951 – 1994)	1951, 1955, 1960, 1961, 1969, 1970, 1971, 1973.	1960 - 1961, 1969 - 1970 - 1971.
7	Jammu (1951 – 2000)	1951, 1952, 1954, 1960, 1961, 1962, 1965.	1951 - 1952, 1960 - 1961 - 1962.
8	Kargil (1955 – 1984)	1963, 1965, 1967.	NIL
9	Kathua (1901 – 2000)	1902, 1907, 1918, 1920, 1939, 1941, 1949, 1951, 1952, 1960.	1951 - 1952.
10	Kishtwar (1901 – 1962)	1934, 1941, 1944, 1945.	1944 - 1945.
11	Kulgam (1951 – 2000)	1951, 1952, 1967, 1968, 1971, 1978, 1979.	1951 - 1952, 1967 - 1968, 1978 - 1979.
12	Kupwara (1951 – 2000)	1955, 1958, 1960, 1962, 1970, 1971, 1999, 2000.	1970 - 1971, 1999 - 2000.
13	Leh (1951 – 2000)	1958, 1959, 1963, 1965, 1966, 1967, 1971, 1972, 1981, 1998.	1958 - 1959, 1965 - 1966 - 1967, 1971 - 1972.
14	Pulwama (1952 – 1982)	1960, 1970, 1971, 1977, 1979, 1980, 1981, 1982.	1970 - 1971, 1979 - 1980 – 1981 - 1982.
15	Rajouri (1951 – 1995)	1967.	NIL
16	Ramban (1951 – 1985)	1951, 1952, 1955, 1970, 1971.	1951 - 1952, 1970 - 1971.
17	Reasi (1951 – 2000)	1951, 1952, 1962, 1969, 1987.	1951 – 1952
18	Samba (1901 – 1969)	1902, 1913, 1920, 1922, 1930, 1934, 1935, 1939, 1949, 1951, 1954.	1934 - 1935.
19	Shopian (1960 – 1994)	1974, 1977, 1979, 1980.	1979 - 1980.
20	Srinagar (1951 – 2000)	1952, 1970, 1971, 1974, 1977, 1999, 2000.	1970 - 1971, 1999 - 2000.
21	Udhampur (1951- 1996)	1951, 1960, 1969.	NIL

Fig. 10 shows the percentage frequency of drought and years of successive drought in the districts during the period 1951-2000 or other period (1901-2000). The following table (ii) shows the years of severe drought for various districts, with the actual rainfall expressed as percentage of normal rainfall given in brackets against each district.

Table (ii)

S. No.	Affected Districts	Years of severe Drought (Rainfall less than 50%)
1	Anantnag	1970 (49%).
2	Badgam	1971 (49%).
3	Bandipora	1964 (47%).
4	Baramulla	1970 (22%), 1971, 1973, 1977, 1981.
5	Ganderbal	1955, 1960 (38%).
6	Jammu	1951 (45%).
7	Kargil	1963, 1965 (18%), 1967.
8	Kathua	1902, 1951 (38%), 1952.
9	Kulgam	1951 (32%), 1967, 1968.
10	Pulwama	1981 (47%).
11	Rajouri	1967 (28%).
12	Ramban	1951, 1952 (30%)
13	Samba	1902 (39%), 1951.
14	Shopian	1977 (49%).

It is observed that the lowest annual rainfall as percentage of the normal was in Kargil district (18% of the normal rainfall) in the year 1965. However, the lowest amount of annual rainfall at any district of the state was 52.2 mm received in Leh district in 1998.

It is observed that in year 1971 ten districts out of 22 and 8 districts out of 22 experienced droughts in year 1951.

Excessive Rainfall:

Rainfall sufficiently in excess of the normal is a predominant factor for occurrence of floods, particularly in high rainfall regions. An annual rainfall of 125% or more of the normal is considered as excessive rainfall.

Fig. 11 shows the percentage frequency of excessive rainfall years and successive years of excessive rainfall during the period 1951-2000 or other period (1901-2000). The following table (iii) gives the district wise excessive rainfall years and the highest annual rainfall (expressed as percentage of normal) with the years of occurrence.

Table (iii)

S. No.	Names of district Affected (Data period under consideration)	Years of excessive rainfall	Highest Amount of Rainfall in cm	Rainfall in% of normal	Year
1	Anantnag (1951 – 2000)	1966, 1972, 1986, 1987, 1988, 1989, 1990, 1994, 1996.	153.9	155%	1972
2	Badgam (1959 – 2000)	1966, 1975, 1992.	123.9	184%	1992
3	Bandipora((1951 – 1994)	1961, 1967, 1969, 1972, 1982.	100.2	146%	1961
4	Baramulla (1951 – 2000)	1986, 1987, 1988, 1989, 1990, 1992, 1995, 1996, 1997, 1998.	202.1	184%	1998
5	Doda (1960 – 2000)	1988, 1990	181.5	136%	1988
6	Ganderbal (1951 – 1994)	1956, 1957, 1982.	209.6	209%	1956
7	Jammu (1951 – 2000)	1982, 1986, 1988, 1994, 1996, 1997.	192.8	160%	1996
8	Kargil(1955 – 1984)	1957, 1959.	64.5	202%	1957
9	Kathua (1901 – 2000)	1909, 1914, 1917, 1942, 1950, 1955, 1956, 1959, 1961, 1968.	212.3	149%	1914
10	Kishtwar (1901 – 1962)	1903, 1911, 1914, 1917, 1923, 1928, 1930, 1933, 1942 .	132.3	149%	1914
11	Kulgam (1951 – 2000)	1961, 1962, 1966, 1972, 1982, 1986, 1988, 1994, 1995, 1996, 1997.	189.8	174%	1996
12	Kupwara (1951 – 2000)	1954, 1972, 1980, 1986, 1996.	148.4	141%	1996
13	Leh (1951 – 2000)	1956, 1957, 1961, 1969.	17.3	179%	1961

Table (iii)

	Names of district Affected (Data period under consideration)	Years of excessive rainfall	Highest amount of Rainfall in cm	Rainfall in% of normal	Year
14	Poonch (1951 – 2000)	Nil	157.5	108%	1995
15	Pulwama (1952 – 1982)	1954, 1956, 1966, 1969, 1972, 1973, 1976.	81.0	160%	1954
16	Rajouri (1951 – 1995)	1968	191.4	200%	1968
17	Ramban (1951 – 1985)	1975, 1986, 1990, 1996, 1997.	206.3	155%	1990
18	Reasi (1951 – 2000)	1959 1961 1988 1990 1994 1997	317.8	155%	1988
19	Samba (1901 – 1969)	1903, 1914, 1916, 1917, 1926, 1942, 1944, 1950, 1955, 1959, 1961, 1966, 1967.	202.0	181%	1917
20	Shopian (1960 – 1994)	1962, 1972, 1973, 1995.	168.7	206%	1972
21	Srinagar (1951 – 2000)	1957, 1966, 1983, 1986, 1996.	117.3	168%	1957
22	Udhampur (1951 – 1996)	1955, 1956, 1959.	276.7	1952	1956

From the above table, it is seen that during the the period under consideration, there were 57 years in which some districts or the other in the state recorded excessive rainfall. In the year 1956, Ganderbal district received highest excessive rainfall, i.e. 209% of the annual normal rainfall, while in the year 1988, the maximum annual rainfall is received 317.8 cm in Reasi district which is 155% of the annual normal rainfall. In the years 1986 and 1996, maximum number of districts (i.e. 7 out of 22) of the state experienced excessive rainfall. Samba district experienced maximum number of excessive rainfall years (13), while no excessive rainfall in Poonch district experienced in any year. The successive years of excessive rainfall against each district are listed below:

Successive years of Excessive Rainfall (Districtwise)

District	Years of Excessive Rainfall	Successive years of Excessive Rainfall
Anantnag	1966, 1972, 1986, 1987, 1988, 1989, 1990, 1994, 1996.	1986 - 1987 - 1988 - 1989 - 1990 .
Badgam	1966, 1975, 1992.	NIL
Bandipora	1967, 1969, 1972, 1982.	NIL
Baramulla	1986, 1987, 1988, 1989, 1990, 1992, 1995, 1996, 1997, 1998.	1986 - 1987 - 1988 - 1989 - 1990, 1995 - 1996 - 1997 - 1998.
Doda	1988 1990	NIL
Ganderbal	1956, 1957, 1982.	1956 - 1957.
Jammu	1982, 1986, 1988, 1994, 1996, 1997.	1996 - 1997.
Kargil	1957, 1959.	NIL
Kathua	1909, 1914, 1917, 1942, 1950, 1955, 1956, 1959, 1961, 1968.	1955 - 1956.
Kishtwar	1903, 1911, 1917, 1923, 1928, 1930, 1933, 1942.	NIL
Kulgam	1961, 1962, 1966, 1972, 1982, 1986, 1988, 1994, 1995, 1996, 1997.	1961 - 1962, 1994 - 1995 – 1996 - 1997.
Kupwara	1954, 1972, 1980, 1986, 1996.	NIL
Leh	1956, 1957, 1961, 1969.	1956 - 1957.
Poonch	NIL	NIL
Pulwama	1954, 1956, 1966, 1969, 1972, 1973, 1976.	1972 - 1973.
Rajouri	1968	NIL
Ramban	1975, 1986, 1990, 1996, 1997.	1996 -1997,
Reasi	1959, 1961.	NIL
Samba	1903, 1914, 1916, 1917, 1926, 1942, 1944, 1950, 1955, 1959, 1961, 1966, 1967.	1916 - 1917, 1966 - 1967.
Shopian	1962, 1972, 1973, 1995.	1972 - 1973.
Srinagar	1957, 1966, 1983, 1986, 1996.	NIL
Udhampur	1955, 1956, 1959.	1955 - 1956.

The heaviest one day rainfall on record at any station in the state was 406.4 mm on 19 January 1954 at Sopore in Baramulla district.

Cyclonic storms and depressions

Table VII depicts the number of storms/depressions which affected the state during the period 1891- 2013. The cyclonic storms and depressions which affect the India, mostly originate and/or intensify over the Bay of Bengal, mainly during the months of May to November. They usually travel northwestwards or westwards and cross the east coast of India. In general, storm does not reach towards the state and even though depressions become very weak as they rarely reach on the land of Jammu and Kashmir as state is about 1800 km away from the east coast of India. The state therefore does not experience the full fury of depressions like the coastal regions. However, in association with these systems, heavy rainfall occurs over the affected districts. During this period there are only two occasions i.e. in the month of September in years 1905 and 1906 when the state was affected by depressions but not affected by a single storm.

Other Weather Phenomena

(a) Western Disturbances

Western disturbance (WD) is a synoptic system in mid latitude which moves from west to east across north India. It can be seen as a low pressure area over north Pakistan and neighbourhoods which is extended at least up to 0.9 km as a cyclonic circulation in the lower troposphere. The WDs develop over Mediterranean sea, Black sea and Caspian sea and move eastward. Life period of sequence of WD is 2 to 4 days. The disturbances mostly affect Indian subcontinent to the north of 25°N latitude.

The state is strongly affected by WDs in winter. On an average 6 to 7 WDs per month move across the state in January and February. They are

less frequent in post monsoon and pre-monsoon seasons. Their frequency is 2 to 4 in November and December and about 5 in March and April and 2 to 3 in May. The weather associated with western disturbances over the state are of precipitation, cold wave condition (severe cold) and fog.

Due to movement of WDs precipitation occurs over the state. Precipitation in the form of rain and snow generally occurs in the forward sector of the WD as a thundershower. The higher reaches of the state often get heavy snowfall during the winter season. Hails also occur over the state in association with the WDs.

The chilly weather in the state is experienced with the movement of WDs. Cold wave conditions generally prevail during November to March along with WDs in the state. Cold waves occur in the rear sector of western disturbances. The lowest temperature in cold wave generally reaches on the second night of the cold spell, when the minimum temperature in cold waves drops as much as 8°C to 10°C below normal. A spell of cold wave usually lasts for about 4 to 5 days. The state is most affected by severe cold wave approximately 4 spells per year.

(b) Thunderstorms, Hail storms and Dust storms

Convective activity is responsible for the occurrence of thunderstorms, hailstorms and dust storms in Jammu and Kashmir. With the advance of the summer, thunderstorm activity becomes pronounced due to unequal heating of the land. When the moisture in the atmosphere is sufficient, thunderstorms or hail storms occur with association of convective clouds. The maximum number of thunderstorms occurs with availability of moisture in large scale and monsoon current, so its frequency reaches maximum in May or June or July in the state, while dust storms are mainly confined in the plain areas during summer months when atmosphere is dry.

Thunderstorms occur throughout the year in the state but its frequency is more during the period from March to September. In Jammu region its frequency is more than Kashmir and Ladakh region. The annual number of thunderstorm days in Jammu region is about 65. In Kashmir region it is about 50. In Ladakh region it is about 5. The areas of high thunderstorm activity are also the areas of hailstorms and squalls. In Jammu and Reasi districts the hailstorms are occurred throughout the year and in other districts they are observed mainly during the pre-monsoon months. Squalls occasionally occur in the state, mainly during the pre-monsoon and early southwest monsoon months. During the winter season, the state occasionally experiences thunderstorm activity.

(c) Fog

Fog is experienced during the post monsoon and winter months, when the air is still moist and is easily cooled below the dew point while rising over high elevations. Favourable conditions for formation of fog such as light to calm wind, sufficient humidity, clear skies, low temperatures etc., do exist after the withdrawal of the monsoon till March, maximum frequency of fog occurrence being during the months of December and January. Fog generally occurs in the hilly terrain of the state during winter and southwest monsoon months. Fog occurs throughout the year at Gulmarg (Baramulla district) and Srinagar and its frequency is maximum at Gulmarg and it is about 30.

Fog is also experienced along with western disturbances over the state. In association with WDs, conditions become favourable for occurrence of fog over large areas mainly in its rear sector of WDs and sometimes ahead of it. The low level moisture content, stability and light wind conditions become favourable for its formation. In the rear sector of the western disturbance radiation fog occurs one or two days after the cessation of rainfall. Normally the fog occurs in the early morning and may prevail till late forenoon.

(d) Earthquakes

Jammu and Kashmir state is prone to seismic activity and comes under seismic zone V. Details of earthquakes of intensity of 5.0 or more at Richter scale having epicenter of the highest intensity earthquake month wise in the state are given in Table VIII. The state has experienced 238 earthquakes under moderate and high intensity during the period 1862-2013. Moderate to heavy damage in property and human life occurred due to these events of the earthquakes in the state as well as its neighboring regions. The state has maximum frequency (56) of earthquakes experienced in the month of October. The highest intensity earthquake was experienced of 8.0 at Richter scale having epicenter at $32^{\circ} 18'$ N latitude and $76^{\circ} 15'$ E longitudes in April 1905.

TABLE – I
MEAN WIND SPEED (kmph) AND PREDOMINANT WIND DIRECTION

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
JAMMU & KASHMIR														
Badarwah	a m e	2.2 C/SE C/NE/SE	2.3 C/SE C/NE/N/SE	2.6 C/NE/SE C/NE/N/SE/SW	2.6 C/NE/N C/N/SW/NW	2.1 C/NE C/N/S/NW	2.0 C./NE/N N/C/NE/NW	1.3 C/NE C/N/NE	1.2 C/NE C/N/NE	1.6 C/NE/SE C/SW/N/NE	2.0 C/SE C/SW/ N/NE	2.1 C/SE C/N/ NE/NW	2.1 C/SE/NE C/NE	2.0
Batote	a m e	1.9 C/NW/SW C/SW	2.0 C/NW C/SW	2.4 C/NW C/SW	2.8 C/NW C/SW	2.5 C/NW C/SW/NW	2.8 C/NW/NE C/SW	2.8 C C/SW	2.4 C SW	2.4 C SW	2.2 C/NW/SW SW	1.8 C/NW C/SW	1.8 C/NW C/SW	2.3
Banihal	a m e	C/N C/N	C/N C/N	C/N C/N	C/N C/N	C/N C/N	C C/S/N	C C/S	C C/S	C C/S	C C/N	C/N C/N	C/N C/N	
Jammu	a m e	4.4 NE C/W/SW	4.9 NE SW/W/C/NW	5.4 NE SW/W/C/NW	5.7 NE SW/W/NW/C	6.1 NE/C SW/C/W/NW	5.1 NE SW/W/NW/C	4.3 C/NE/E C/SW/W/S	3.6 C/NE/E C/SW/W	4.1 NE C/SW/NW/W	4.6 NE C/SW	4.6 NE C/NW	4.2 NE C/NW	4.7
Katra	a m e	1.6 C/E C/W	2.0 C/E C/W/SW	2.4 C/E C/W/SW	2.2 C/E/SE C/W/SW	2.3 C/E/W/SE C/W	1.9 C/E/SE C/W	1.6 C/E/SE C/W/SW	1.4 C/E/SE C/W	1.2 C/E/SE C/W	1.2 C/E C/W	1.0 C/E C/W	1.3 C/E C/W	1.7
Kukernagh	a m e	2.7 SE/C C/SE/NW	3.2 SE/C C/NW/SW	3.8 SE C/NW/SE	4.2 SE C/SE/NW	3.6 C/SE C/SE/NW	3.8 C/SE C/SE/NW	2.8 C/SE C/SE/NW	2.8 C/SE C/SE/NW	3.4 SE/C C/SE/SW	4.6 SE C/SE	4.0 SE C/SE	2.8 C/SE C	3.5
Pahalgam	a m e	C C/S/SW	C C/SW/W/S	C/NE C/SW/SE/S/W	C/N/S C/SW/W/S	C/S C/SW/S	C C/SW/S	C C/SE/SW/S	C C/SW/SE/S	C C/SW/SE/S/W	C C/SW	C C/SW/W	C C	
Gulmarg	a m e	W W	W W	W W	W W	W W	W W	W W	W W	W W	W W	W W	W W	
Quazigund	a m e	2.1 C C/S/SW/W	2.6 C C/SW/S/W	3.0 C/S/SW/W C/SW/S/W	2.6 C/SW/S/W C/SW/W	2.3 C/E/W C/SW/E/W	2.6 C/E/W C/W/SW/E	3.1 C/E/W C/SW/W	2.7 C C/SW/W	2.4 C C/SW/W	2.0 C C/SW/W	1.7 C C/SW/S	1.6 C C/SW/S	2.4

TABLE – I (Contd...)
MEAN WIND SPEED (kmph) AND PREDOMINANT WIND DIRECTION

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
JAMMU & KASHMIR														
Kupwara	a m e	0.5 C/N C/W/N/SW/NW	0.6 C/N C/NW/W/N/SW	0.7 C/N C/W/NW	0.9 C C/W/NW	0.7 C C/W/N	0.6 C C/W/SW/NW	0.5 C C/W/NW	0.3 C C/W/SW	0.4 C/N C/W/SW/NW	0.5 C/N C/W/NW/SW	0.6 C/N C/W/SW/NW	0.5 C/N C/W/SW	0.6
Srinagar	a m e	1.7 C/SE/NW C/NW/W	2.4 C/SE/NW C/NW	2.9 C/SE/NW NW/C	3.3 C/SE/NW NW/C	3.0 C/SE/NW C/NW/W	2.9 C/SE/NW C/NW/SW/W	2.7 C/SE/NW C/NW/SW/W	2.3 C/SE/NW C/NW/SW/SE	2.1 C/SE C/NW/W/SW	2.0 C/SE C/NW/W	1.7 C/SE C/NW	1.6 C/SE C/NW/W	2.4
Leh	a m e	4.0 C/NE/SW/S C/SW	4.7 C/NE/SW SW	6.1 C/S/SW SW	7.2 C/SW/S SW/W	7.4 C/S/SW SW/W	7.0 C/SW/S W/SW/NW	5.8 C/SW SW/W	5.6 C/SW/W SW/W	5.5 C/S/SW SW/W	5.5 C/S/SW SW	5.6 C/S/SW SW	4.6 C/S/SW C/SW	5.8
State Mean	a	2.3	2.7	3.3	3.5	3.3	3.2	2.8	2.5	2.6	2.7	2.6	2.3	2.8

a Mean Wind Speed in kms per hour
m Predominant wind direction in the morning
e Predominant wind direction in the evening
C Calm

TABLE II (a)
MEAN MAXIMUM AND MEAN MINIMUM TEMPERATURE (°C)
JAMMU REGION

STATION	Temp.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Badarwah	Max.	11.6	12.4	16.8	23.3	27.0	31.0	30.4	30.1	28.6	24.6	19.8	14.7	22.5
	Min.	-1.9	-0.7	2.4	6.6	9.4	13.6	16.5	16.0	11.8	6.3	2.7	0.0	6.9
Banihal	Max.	9.8	10.8	15.6	21.9	25.3	28.7	28.3	28.0	27.0	24.1	18.9	13.7	21.0
	Min.	-0.4	0.6	4.0	8.3	11.1	14.6	17.4	16.8	12.5	6.8	3.4	1.1	8.0
Batote	Max.	10.3	11.5	15.2	21.8	25.8	28.7	26.6	26.4	25.6	23.1	18.1	13.6	20.6
	Min.	1.2	2.1	5.1	9.8	12.9	16.2	17.9	17.6	14.4	9.4	5.5	3.1	9.6
Jammu	Max.	18.9	21.6	25.9	32.0	37.2	38.7	34.0	33.1	33.1	31.2	26.6	21.2	29.5
	Min.	7.8	9.8	13.9	18.9	23.3	26.0	25.3	24.8	23.1	18.1	13.0	9.0	17.8
Katra	Max.	17.0	18.9	22.8	29.0	33.9	35.6	31.2	30.1	30.1	28.2	24.1	19.6	26.7
	Min.	5.8	7.3	11.0	15.8	19.8	21.9	21.4	20.8	18.8	14.4	10.5	7.3	14.6
REGION MEAN	Max.	13.5	15.0	19.3	25.6	29.8	32.5	30.1	29.5	28.9	26.2	21.5	16.6	24.1
	Min.	2.5	3.8	7.3	11.9	15.3	18.5	19.7	19.2	16.1	11.0	7.0	4.1	11.4

TABLE II (b)
MEAN MAXIMUM AND MEAN MINIMUM TEMPERATURE (°C)
KASHMIR VALLEY

STATION	Temp.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Gulmarg	Max.	0.7	1.1	4.5	10.5	14.9	20.0	20.6	20.4	18.7	14.2	9.1	4.5	11.6
	Min.	-7.9	-7.4	-3.6	1.5	5.3	9.3	11.7	11.4	7.9	3.2	-1.2	-5.0	2.1
Kukernag	Max.	4.1	7.0	11.9	18.5	22.6	26.7	27.2	27.1	25.1	20.2	13.4	7.5	17.6
	Min.	-4.3	-2.1	2.0	6.3	9.5	13.3	16.1	15.3	11.4	6.6	2.1	-1.7	6.2
Kupwara	Max.	6.4	8.6	13.2	20.6	24.6	28.6	30.1	30.2	28.7	23.2	16.0	9.1	19.9
	Min.	-2.8	-1.2	2.1	6.5	9.7	13.1	16.9	16.2	10.9	5.1	0.9	-1.8	6.3
Pahalgam	Max.	3.7	5.9	10.4	17.1	20.6	24.6	25.4	25.5	23.7	19.0	12.4	6.7	16.3
	Min.	-7.9	-5.9	-1.1	2.8	5.5	8.1	12.1	12.2	8.1	2.3	-1.6	-4.4	2.5
Quazigund	Max.	6.3	8.6	13.8	20.0	23.4	27.4	28.0	27.8	26.5	22.0	16.0	9.3	19.1
	Min.	-3.1	-1.5	2.7	6.8	9.9	13.6	16.9	15.9	11.2	5.5	1.3	-1.6	6.5
Srinagar	Max.	6.3	8.8	13.9	20.4	24.4	29.1	30.0	29.5	27.8	22.4	15.6	8.8	19.8
	Min.	-2.1	-0.2	3.6	7.7	10.8	14.7	18.2	17.4	12.5	5.7	1.0	-1.6	7.3
REGION MEAN	Max.	4.6	6.7	11.3	17.9	21.8	26.1	26.9	26.8	25.1	20.2	13.8	7.7	17.4
	Min.	-4.7	-3.1	1.0	5.3	8.5	12.0	15.3	14.7	10.3	4.7	0.4	-2.7	5.2

TABLE II (c)
MEAN MAXIMUM AND MEAN MINIMUM TEMPERATURE (°C)
LADAKH REGION

STATION	Temp.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Leh	Max.	-2.0	1.5	6.5	12.3	16.2	21.8	25.0	25.3	21.7	14.6	7.9	2.3	12.8
	Min.	-14.4	-11.0	-5.9	-1.1	3.2	7.4	10.5	10.0	5.8	-1.0	-6.7	-11.8	-1.3

TABLE III
MEAN RELATIVE HUMIDITY (%)

JAMMU AND KASHMIR

STATION	HR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Badarwah	M	79	81	77	65	63	63	77	81	76	71	69	68	73
	E	66	66	61	50	52	50	65	68	59	52	57	59	59
Banihal	M	75	75	72	65	63	63	80	85	84	74	67	63	72
	E	57	56	52	46	46	45	61	64	59	48	44	48	52
Batote	M	72	73	70	59	58	61	81	84	76	62	64	61	68
	E	66	67	62	52	48	51	73	76	72	57	57	55	61
Gulmarg	M	80	82	81	71	70	64	78	80	71	60	63	71	73
	E	78	78	75	66	64	59	74	75	65	56	61	69	68
Jammu	M	83	77	68	55	46	52	78	84	79	69	74	80	70
	E	62	54	49	39	32	37	64	72	65	57	63	68	56
Katra	M	73	68	61	50	44	52	82	87	79	65	66	67	66
	E	70	63	55	42	36	42	75	83	75	62	64	68	64
Kukernag	M	87	83	73	63	62	59	73	75	65	60	66	79	70
	E	80	73	64	55	55	50	65	67	60	57	67	74	64
Kupwara	M	89	89	86	81	80	78	82	86	84	81	86	89	84
	E	75	72	66	59	58	52	64	63	54	54	64	71	63
Pahalgam	M	89	90	84	74	72	73	84	89	86	82	85	89	83
	E	84	78	70	60	58	56	65	67	61	59	68	75	67
Quazigund	M	91	88	83	73	73	70	79	83	79	74	80	88	80
	E	72	67	58	51	54	52	62	64	55	50	57	67	59
Srinagar	M	93	90	84	74	71	67	76	80	79	81	89	92	81
	E	72	65	57	49	51	44	55	57	52	54	62	72	58
Leh	M	50	51	49	42	39	33	40	40	37	38	42	46	42
	E	51	51	46	36	30	26	33	34	31	27	40	46	38
State Mean	M	80	79	74	64	62	61	76	80	75	68	71	74	72
	E	69	66	56	50	46	47	63	66	59	53	59	64	58

M MORNING
E EVENING

TABLE IV
MEAN CLOUD AMOUNT ** (OKTA OF THE SKY) AND NUMBER OF DAYS OF CLEAR AND OVERCAST SKIES
AT 0830 HRS IST
JAMMU AND KASHMIR

Station/Observatory		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Badarwah	a	12	8	8	12	14	14	3	4	13	22	19	14	143
	b	8	8	10	5	5	3	10	7	3	1	3	5	68
	c	3.7	4.2	4.3	3.0	2.7	2.3	4.7	4.3	2.5	1.2	1.8	2.9	3.1
Banihal	a	8	7	7	11	15	14	4	3	11	21	17	13	131
	b	10	9	10	6	4	3	10	9	4	2	3	5	75
	c	4.1	4.3	4.5	3.4	3	2.3	4.9	4.7	2.8	1.4	2.1	3.2	3.4
Batote	a	10	7	6	12	13	14	3	4	12	23	18	13	135
	b	8	8	9	5	4	3	12	7	3	1	2	5	67
	c	3.9	4.2	4.3	3.1	2.6	2.2	4.9	4.5	2.6	1.1	1.9	3	3.2
Gulmarg	a	3	2	2	5	5	7	1	1	6	16	16	13	77
	b	16	15	16	5	4	2	5	4	3	2	3	5	80
	c	5	5	5	4.2	3.7	2.6	4.7	4.3	2.8	2.1	2.9	4.2	3.9
Jammu	a	10	7	7	9	12	13	3	3	11	20	16	11	122
	b	5	4	6	3	2	2	8	7	2	1	1	4	45
	c	3.7	3.6	4	3.2	2.6	2.4	5	5	2.7	1.4	1.7	3.2	3.2
Katra	a	16	12	15	16	18	17	6	7	15	22	22	19	185
	b	6	5	6	3	2	3	12	10	3	2	1	4	57
	c	3.2	3.2	3.5	2.6	2.1	2.1	4.8	4.3	2.3	1.3	1.4	2.5	2.8
Kukernag	a	5	3	4	10	9	15	4	5	13	18	14	8	108
	b	14	12	12	7	6	2	6	5	3	3	5	10	85
	c	5.4	5.4	5.2	3.7	3.3	2.1	4.4	4	2.4	1.9	2.9	4.5	3.8
Kupwara	a	5	5	4	10	12	13	8	8	13	17	13	9	117
	b	17	13	15	8	6	3	5	5	4	4	6	12	98
	c	5.4	5.4	5.3	3.8	3	2.3	3.5	3.5	2.5	2.1	3.1	4.5	3.7
Pahalgam	a	8	7	8	11	12	14	4	4	12	20	16	13	129
	b	14	12	14	7	6	3	7	6	3	2	6	8	88
	c	4.7	4.8	4.7	3.6	3.4	2.3	4.2	3.9	2.6	1.8	2.6	3.7	3.5
Quazigund	a	3	2	3	7	10	12	3	2	11	16	15	8	92
	b	16	14	14	7	5	2	6	6	3	3	4	10	90
	c	5.8	5.8	5.6	4.1	3.5	2.6	4.9	4.8	2.8	1.9	2.8	4.7	4.1
Srinagar	a	3	2	3	6	8	11	3	3	11	17	13	6	86
	b	15	13	11	7	5	2	6	5	3	2	4	12	85
	c	6	6	5.4	4.2	3.5	2.5	4.5	4.4	2.9	2	3	4.9	4.1
Leh	a	8	6	5	6	7	6	7	5	9	17	10	10	96
	b	8	5	6	4	3	2	4	3	2	1	3	5	46
	c	4.6	4.5	4.2	3.5	3.4	2.6	3.5	3.7	2.6	1.7	2.6	3.8	3.4
State Mean	a	8	6	6	10	11	13	4	4	11	19	16	11	119
	b	11	10	11	6	4	3	8	6	3	2	3	7	74
	c	4.6	4.7	4.7	3.5	3.1	2.4	4.5	4.3	2.6	1.7	2.4	3.8	3.5

a :- DAYS WITH CLEAR SKY.

b :- DAYS WITH SKY OVERCAST

c :- MEAN CLOUD AMOUNT

** OKTA=UNIT, EQUAL TO AREA OF ONE EIGHTH OF THE SKY USED IN SPECIFYING CLOUD AMOUNT
 FOR EXAMPLE :- 1 OKTA MEANS 1/8 TH OF THE SKY.

TABLE IV A
MEAN CLOUD AMOUNT **(OKTA OF THE SKY) AND NUMBER OF DAYS OF CLEAR AND OVERCAST SKIES
AT 1730 HRS IST
JAMMU AND KASHMIR

Station/Observatory		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Badarwah	a	8	5	3	3	3	2	1	1	4	13	15	13	71
	b	10	9	11	9	7	4	7	6	4	2	3	5	77
	c	4	4.8	5.3	4.8	4.7	4	4.9	4.8	3.6	2.1	2.2	3.1	4.0
Banihal	a	8	5	3	4	3	3	1	1	3	13	14	12	70
	b	11	10	13	8	7	4	6	6	4	2	3	5	79
	c	4.3	4.8	5.2	4.9	4.7	4	4.7	4.8	3.8	2.5	2.5	3.4	4.1
Batote	a	8	4	2	3	3	4	1	0	3	13	15	13	69
	b	8	9	10	7	5	3	6	5	3	1	2	5	64
	c	4.1	4.9	5.3	4.5	4.3	3.6	4.8	4.6	3.5	2.1	2.1	3.1	3.9
Gulmarg	a	2	1	0	0	0	1	0	0	0	2	4	2	12
	b	5	13	15	6	6	3	4	3	2	2	2	4	65
	c	4.6	5.1	5.5	5.3	5.1	4.3	4.6	4.6	3.7	3.3	3.4	4.3	4.5
Jammu	a	7	4	2	2	3	4	1	1	4	12	11	8	59
	b	4	4	5	3	2	1	4	3	1	1	1	4	33
	c	3.6	4	4.5	3.9	3.4	2.8	4.4	4.4	2.6	1.4	2.1	3.3	3.4
Katra	a	14	9	10	10	11	10	3	2	9	20	19	17	134
	b	7	6	5	3	3	3	7	7	2	1	1	4	49
	c	3.5	3.9	4	3.1	3	2.9	5	4.9	3	1.5	1.7	2.6	3.3
Kukernag	a	5	2	2	3	2	5	2	2	6	9	10	7	55
	b	12	9	11	8	7	3	4	3	2	3	5	9	76
	c	4.9	5.1	5.3	4.8	4.7	3.3	4.2	4	3.1	2.7	3.1	4.4	4.1
Kupwara	a	6	4	2	3	3	4	3	2	4	8	9	7	55
	b	12	12	14	8	8	4	5	4	3	4	6	11	91
	c	4.9	5.2	5.6	4.7	4.7	3.9	4.2	4.1	3.5	3.1	3.5	4.4	4.3
Pahalgam	a	4	2	1	2	1	3	1	1	3	9	12	9	48
	b	16	14	15	11	11	5	7	6	4	4	6	10	109
	c	5.4	5.8	6	5.5	5.3	4.3	4.9	4.7	4	3.1	3.3	4.2	4.7
Quazigund	a	4	2	1	2	1	2	0	0	2	7	11	6	38
	b	11	9	10	7	6	3	3	3	2	2	3	9	68
	c	5.1	5.1	5.5	5.1	5	3.8	4.5	4.6	3.6	2.8	3	4.4	4.4
Srinagar	a	3	1	1	1	1	1	0	0	1	5	8	4	26
	b	10	11	11	9	7	3	3	3	3	2	3	8	73
	c	5.2	5.3	5.6	5.2	5.2	3.9	4.3	4.2	3.5	3	3.1	4.4	4.4
Leh	a	4	4	1	2	3	3	4	3	4	9	9	7	53
	b	8	7	8	5	4	2	3	3	3	1	3	5	52
	c	4.4	4.9	5	4.7	4.7	3.3	3.6	3.9	3	2.6	3	3.8	3.9
State Mean	a	6	4	2	3	3	4	1	1	4	10	11	9	58
	b	10	9	11	7	6	3	5	4	3	2	3	7	70
	c	4.5	4.9	5.2	4.7	4.6	3.7	4.5	4.5	3.4	2.5	2.8	3.8	4.1

a :- DAYS WITH CLEAR SKY.

b :- DAYS WITH SKY OVERCAST

c :- MEAN CLOUD AMOUNT

** OKTA=UNIT,EQUAL TO AREA OF ONE EIGHTH OF THE SKY USED IN SPECIFYING CLOUD AMOUNT

FOR EXAMPLE :- 1 OKTA MEANS 1/8 TH OF THE SKY.

TABLE-V
MEAN RAINFALL (MM) AND NUMBER OF RAINY DAYS
JAMMU & KASHMIR

DISTRICT		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Anantnag	a	66.9	91.8	157.0	124.4	111.9	67.3	94.9	94.7	60.3	43.3	34.6	45.5	992.6
	b	5.7	7.1	9.2	8.8	8.5	5.4	7.6	7.0	4.6	3.4	2.6	3.8	73.7
Badgam	a	56.6	67.0	107.4	88.3	79.3	35.4	55.5	55.4	40.1	32.7	27.6	28.1	673.4
	b	4.8	5.5	8.1	7.5	6.6	3.4	5.1	4.6	2.9	2.8	2.3	2.8	56.4
Bandipora	a	66.1	95.5	119.6	85.7	63.7	27.8	44.3	56.0	32.7	38.0	24.0	33.0	686.4
	b	6.6	8.2	8.9	7.3	5.8	2.8	5.1	4.9	3.1	3.0	2.7	3.6	62.0
Baramulla	a	116.8	145.6	183.6	141.2	107.6	59.6	72.3	66.9	54.0	45.7	37.5	67.8	1098.6
	b	6.0	7.4	9.9	9.3	8.0	5.0	5.7	5.6	3.5	3.1	2.6	3.9	70.0
Doda	a	119.3	162.5	213.5	128.4	100.2	72.7	146.3	126.1	96.6	40.9	43.8	84.2	1334.5
	b	7.0	8.3	9.5	7.4	7.9	6.6	10.0	9.1	5.1	2.7	2.7	4.3	80.6
Ganderbal	a	102.1	110.6	126.1	122.9	103.9	65.0	78.0	70.6	68.5	69.4	29.8	55.9	1002.8
	b	6.9	7.9	8.9	8.9	8.3	4.6	6.9	7.0	4.4	3.5	2.7	4.4	74.4
Jammu	a	54.8	68.1	69.3	42.2	43.1	59.6	353.2	314.1	110.0	37.9	16.0	36.5	1204.8
	b	3.0	3.7	4.2	2.7	2.6	3.4	10.4	11.3	3.8	1.7	0.7	2.1	49.6
Kargil	a	35.0	38.9	44.2	31.7	30.0	12.9	22.9	32.1	10.1	13.4	24.0	24.2	319.4
	b	3.2	3.3	4.3	2.9	3.2	1.3	1.4	1.2	1.1	1.0	1.7	2.0	26.6
Kathua	a	89.3	78.7	64.4	32.9	19.8	64.9	402.2	436.0	153.8	30.9	8.4	43.6	1424.9
	b	4.0	4.1	3.4	2.2	1.5	3.5	12.5	13.6	5.0	1.2	0.6	2.2	53.8
Kishtwar	a	106.2	111.3	140.5	101.7	61.8	41.9	77.6	71.5	63.2	31.5	20.1	60.5	887.8
	b	6.5	6.3	7.6	7.1	4.9	3.3	5.8	5.6	3.4	2.0	1.3	3.9	57.7
Kulgam	a	107.1	126.4	168.9	135.5	111.9	56.7	91.9	84.0	66.8	43.3	38.9	59.3	1090.7
	b	6.3	7.1	8.8	8.1	7.6	3.9	6.3	6.2	3.7	3.0	2.5	3.7	67.2
Kupwara	a	84.3	127.3	198.8	159.2	99.4	48.0	76.9	66.2	34.0	54.5	45.5	58.5	1052.6
	b	7.0	8.6	10.8	9.9	7.5	4.0	5.7	5.0	2.8	3.5	2.9	4.5	72.2
Leh	a	7.1	7.7	9.9	8.1	7.9	5.3	15.6	12.5	10.1	4.1	2.8	5.6	96.7
	b	1.0	1.0	1.2	0.9	0.9	0.7	1.6	1.6	1.0	0.4	0.3	0.8	11.4
Poonch	a	139.0	124.2	158.4	97.5	69.6	101.9	344.1	191.6	108.2	27.3	40.6	55.7	1458.1
	b	8.4	7.4	8.7	6.9	5.6	5.7	15.0	11.1	5.9	2.6	2.2	3.3	82.8
Pulwama	a	42.2	48.7	77.2	72.6	58.0	25.5	42.5	47.6	37.5	21.0	12.6	20.7	506.1
	b	4.1	4.3	6.3	6.7	4.9	2.3	3.8	4.5	2.2	1.9	1.7	2.3	45.0
Rajouri	a	59.4	67.6	51.6	23.6	24.9	46.2	255.6	254.6	100.2	40.3	11.2	21.9	957.1
	b	3.2	5.2	4.4	2.5	2.1	3.6	10.3	10.0	3.5	1.4	0.5	2.1	48.8
Ramban	a	144.7	192.1	211.7	113.8	85.1	61.8	132.0	120.1	86.7	41.5	43.8	97.4	1330.7
	b	6.7	7.7	8.8	6.5	5.9	4.3	8.1	7.1	4.2	2.6	2.2	4.3	68.4
Reasi	a	104.4	103.8	121.0	70.9	47.7	100.5	538.5	611.6	225.6	40.5	20.5	65.1	2050.1
	b	4.9	5.0	6.2	4.1	3.4	5.8	15.1	16.5	8.0	2.2	1.1	2.7	75.0
Samba	a	65.3	53.3	52.7	22.7	20.3	54.0	316.7	345.3	125.0	19.9	7.3	33.7	1116.2
	b	3.2	3.1	2.8	1.5	1.4	2.7	10.4	10.8	4.3	0.7	0.4	1.6	42.9
Shopian	a	48.4	72.8	119.0	121.4	90.7	42.6	84.9	92.0	46.2	31.9	28.8	40.1	818.8
	b	3.8	4.3	7.8	8.5	7.5	4.0	6.3	6.5	3.4	2.4	2.5	2.8	59.8

TABLE-V MEAN RAINFALL (MM) AND NUMBER OF RAINY DAYS JAMMU & KASHMIR														
JAMMU & KASHMIR		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Srinagar	a	52.1	69.3	111.4	90.7	71.8	39.6	54.8	67.6	29.9	35.4	27.4	48.0	698.0
	b	4.9	5.5	8.3	7.1	6.2	3.6	4.7	5.1	2.6	2.4	2.0	3.3	55.7
Udhampur	a	120.0	114.5	143.1	44.5	35.2	91.4	451.0	484.8	209.3	57.5	17.0	51.9	1820.2
	b	5.0	5.0	6.1	3.6	2.3	3.9	14.4	16.0	7.1	1.8	0.8	2.2	68.2
State Mean	a	81.2	94.4	120.4	84.5	65.6	53.7	170.5	168.2	80.4	36.4	25.6	47.1	1028.0
	b	5.1	5.7	7.0	5.9	5.1	3.8	7.8	7.7	3.9	2.2	1.8	3.0	59.0

a : Normal Rainfall in mm

b : Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

TABLE-VI
MEAN RAINFALL(mm) OVER DIFFERENT RIVER CATCHMENTS OF JAMMU & KASHMIR STATE

Sr.No	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1	River Ravi (Catchment.No.204)												
	<u>Districts/Parts of districts within this catchment:-</u> KATHUA,SAMBA /JAMMU,UDHAMPUR,DODA.												
A	77.3	66.0	58.6	27.8	20.1	59.5	359.5	390.7	139.4	25.4	7.9	38.7	1270.6
B	3.6	3.6	3.1	1.9	1.5	3.1	11.5	12.2	4.7	1.0	0.5	1.9	48.4
2	River Chenab (Catchment.No.205)												
	<u>Districts/Parts of districts within this catchment:-</u> REASI,RAMBAN,KISHTWAR,RAJOURI /ANANTNAG,DODA,JAMMU,UDHAMPUR,KULGAM												
A	88.0	110.3	132.7	79.7	68.6	60.2	211.8	208.8	97.3	39.6	27.4	56.4	1180.8
B	4.9	5.9	7.0	5.3	5.0	4.2	9.0	8.9	4.2	2.3	1.6	3.1	61.4
3	River Jhelum (Catchment.No.206)												
	<u>Districts/Parts of districts within this catchment:-</u> POONCH,BARAMULLA,BADGAM,KUPWARA,PULWAMA,SRINAGAR,SHOPIAN,BANDIPORA,GANDERBAL /ANANTNAG,KULGAM												
A	86.8	108.4	152.6	125.3	97.9	55.4	84.3	75.8	53.9	45.5	34.2	51.4	971.5
B	6.1	7.1	9.2	8.7	7.5	4.4	6.4	6.0	3.7	3.1	2.6	3.8	68.4
4	River Indus as far as Pakistan Boundary (Catchment.No.207)												
	<u>Districts/ within this catchment:-</u> LEH, KARGIL												
A	19.1	21.0	24.6	18.2	17.4	8.5	18.7	20.9	10.1	8.1	11.9	13.5	192.1
B	1.9	2.0	2.5	1.7	1.9	1.0	1.5	1.4	1.0	0.6	0.9	1.3	17.8

A : Normal Rainfall in mm

B : Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

TABLE – VII

STORMS AND DEPRESSIONS AFFECTING JAMMU & KASHMIR STATE

DURING 1891 – 2013

MONTHS	NO. OF STORMS/ DEPRESSIONS
JANUARY	NIL
FEBRUARY	NIL
MARCH	NIL
APRIL	NIL
MAY	NIL
JUNE	NIL
JULY	NIL
AUGUST	NIL
SEPTEMBER	2
OCTOBER	NIL
NOVEMBER	NIL
DECEMBER	NIL
TOTAL	2

TABLE VIII

**DETAILS OF EARTHQUAKE OF INTENSITY OF 5.0 OR MORE AT RICHTER SCALE HAVING EPICENTRE
WITHIN JAMMU & KASHMIR STATE DURING YEARS 1862-2013**

MONTHS	YEARS	FREQU- ENCY	EARTHQUAKE OF HIGHEST INTENSITY			EPICENTRE			
			INTENSITY AT RICHTER SCALE	DEPTH IN km	YEAR	LATITUDE-N		LONGITUDE- E	
						DEG	MIN	DEG	MIN
JANUARY	1851 1852 1941 1965 1973 2(1975) 1976 1992 2000 2002	11	6.2	1.0	1975	32	23	78	30
FEBRUARY	1554 1906 1966 2(1967) 1968 1975 1977 1980 1982 1983 2(1993) 1999 2(2004) 2007 2009 2012	19	7.7	NA	1554	35	0	75	0
MARCH	1952 1955 1977 1984 7(1990) 1992 1996 3(2006) 2010 2011 2012	19	6.0	NA	1955	34	36	75	12
				50.0	1990	37	2	72	57
APRIL	1871 1905 1928 1963 1966 4(1975) 1986 1993 2(1999)	13	8.0	NA	1905	32	18	76	15
MAY	1871 1884 1885 1917 1953 1959 1965 1967 1975 1978 1983 1997 2009	13	7.3	NA	1884	33	30	75	30
JUNE	2(1969) 1828 1885 1927 1945 1955 1962 1963 1965 1975 1978 1993	13	6.5	NA	1885	34	0	75	0
				NA	1669	33	24	73	18
				NA	1669	35	0	77	0
				NA	1945	32	36	75	54
JULY	1927 1947 1975 1976 1982 1986 1988 1999 2000 2001 2009 2013	12	6.2	NA	1947	32	36	75	54
AUGUST	3(1926) 1949 4(1950) 1962 1966 2(1980) 1997 2005 2008 2012 2(2013)	18	6.3	NA	1926	35	30	78	0
SEPTEMBER	1827 1923 1929 1943 1950 1951 1963 14(1972) 1976 2(1981) 1993 2001 2006 2011	28	6.5	NA	1943	36	24	73	30
OCTOBER	2(1972) 1973 1976 1980 3(2004) 44 (2005) 2007 2010 2(2013)	56	7.6	10.0	2005	34	29	73	8.4
NOVEMBER	1921 2(1937) 1972 1975 1996 4(2002) 2005	11	6.2	NA	1937	35	6	78	6
DECEMBER	1925 1942 2(1971) 2(1973) 2(1974) 3(1975) 1990 1994 1997 2(2005) 2007 2009	18	6.0	NA	1925	37	0	75	30
OTHER	1552 1662 1735 1778 1784 1803 1863	7	7.7	NA	1778	34	0	75	0
TOTAL		238							

**DISTRICT SUMMARIES OF
JAMMU & KASHMIR**

ANANTNAG DISTRICT

Anantnag district is hilly and mountainous towards the northeast and east with mountain valley in the southwest. The entire southern sector and major part of the eastern region is strewn with thick forests and mountains. The height of these mountains in the east and south of the district ranges between 2438 metres to about 4600 metres above mean sea level. Famous Amarnath cave is situated at Mount Amarnath in Anantnag district, whose altitude is about 5500 metres. On the south and southeast, the district is bounded by mighty Pir Panjal mountain ranges. The district has large number of streams like Sandran, Brengi, Arpath and Lidder. The most important among them is Lidder which takes from Sheshnag lake.

Owing to proximity of Pir Panjal range, which stretches in its south and southeast, the district has a temperate climate in summer. In winter, areas of district are affected by heavy snowfall associated with western disturbance and temperature is relatively low. Being engulfed on two sides by mountains, the monsoon does not generally reach the district. The rainfall is often more in summer (March-May) as compared to other seasons. Winter starts from the middle of November when both the day and night temperatures fall rapidly till mid-February, and lasts till early March. The temperatures start to rise from March and remain steady till August. March to 3rd week of June is the summer season followed by southwest monsoon season till September. The heavy rain generally occurs in the summer months which are mostly pleasant. The period of October to mid-November constitutes a transition period between the monsoon season and winter.

RAINFALL

Records of rainfall in the district are available for seven rain gauge stations for period ranging from 17 to 25 years. The details of rainfall at these stations and for the district as a whole are given in Tables 1 and 2. The average annual rainfall in the district is 992.6 mm. The annual rainfall in the district varies over a large range. The rainfall in southwest monsoon season (June to September) is about 32% of the

annual normal rainfall, while the rainfall in pre-monsoon months of March to May account for about 40% of the annual, March being the month with the highest rainfall receiving an average of 157 mm. The winter months (December to February) contribute rainfall for about 21% of the annual normal rainfall. In the fifty-year period 1951 to 2000, the highest annual rainfall of 155% of the normal was recorded in 1972, while the lowest was 49% of the normal recorded in 1970. During this period, there were 6 years in which the rainfall was less than 80% of the normal and there were two occasions of two consecutive years of such low rainfall. It is seen from Table 2 that annual rainfall was between 701 mm and 1200 mm in 22 years out of 38.

In the district especially in higher mountains, considerable amount of precipitation is received in the form of snow. About 100 cm of snowfall occurred annually in the district. Snowfall mainly occurred in the winter months November to March. About 70% of annual snowfall occurred in December & January.

On an average there are 74 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 46 at Anantnag to 95 at Pahalgam observatory.

The heaviest rainfall recorded in 24 hours at any station in the district was 231.2 mm at Verinagh observatory on 1st August 1976.

TEMPERATURE

Anantnag town is the head quarters of the district at an elevation of about 1588 metres. There are two meteorological observatories in the district, at Kukernag with an elevation of approximately 1900 metres in the south of the district and at Pahalgam with an elevation of about 2300 metres in the northern part. Temperatures and other meteorological conditions depend to a very extent on the topography of the place. The description of climate that follows, is based on the records of meteorological parameters recorded at these observatories. The cold season is from mid-November to early March. Temperatures begin to decrease from the middle of November till early February. January is the coldest month with mean maximum temperature of about 4°C and mean minimum temperature of about -4°C at

observatory stations and they are about 7°C and about -2°C respectively for Anantnag town. The minimum temperature may drop to below -15°C on individual days, in association with cold waves and in extreme hilly part of the district minimum temperature is likely drop down to about -28°C. The day and night temperature begin to rise from March and continues till July or August. The day temperature reaches its highest in July or August, which are the hottest months with mean maximum temperature of about 26°C and mean minimum temperature is about 14°C at observatory stations and that of about 28°C and of about 16°C respectively at Anantnag town. On some days, during the period April to July, at district headquarters the maximum temperature may reach up to about 34°C. Both the temperatures are 10°C to 15°C lower over the places situated at high altitudinal areas in the district. The period of April to June and October to November is of pleasant with cool atmosphere.

The highest maximum temperature ever recorded in the district was 34.9°C on 25 June 2005 at Kukernag observatory and the lowest minimum temperature ever recorded was -18.6°C on 10 January 1986 at Pahalgam observatory.

HUMIDITY

The atmosphere over the district is generally humid throughout the year. It is slightly less humid during April to June and September to November especially in the afternoons when relative humidity is about 50% to 60% but in other months humidity is around 70% to 90%.

CLOUDINESS

The skies are heavily clouded to overcast during winter months December to March, thereafter cloudiness decreases and skies are moderately clouded till June. In months of July and August skies are overcast on some days. The hill tops are frequently enveloped with clouds. In the winter season sky sometimes becomes obscured in the mornings due to lifted fog which clears with the advance of the day.

WINDS

Winds are generally light throughout the year but sometimes it becomes moderate and strong. They mostly blow from the southeast direction throughout the year. Northwesterly and southwesterly components are also seen in the afternoons. Calm conditions are also experienced on many occasions. The district being hilly, local winds such as katabatic and anabatic winds affect to determine the speed and direction of wind at places.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year. During western disturbances thunderstorms are mostly observed. Sometimes precipitation occurs in the form of snow or hail. Its frequency is more in the period April to July and reduces from August with the activity being least in the winter months November to March. Thunderstorms occasionally accompanied with hails. Fog is experienced during the winter months.

Table 3, 4, 5, 6 and 3(a), 4(a), 5(a), 6(a) give the temperature and humidity, cloudiness, mean wind speed and predominant wind directions, special weather phenomena respectively for Kukernag and Pahalgam observatories.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
ANANTNAG

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Anantnag	25	a	40.0	42.5	92.4	56.7	52.3	32.0	44.5	43.6	27.8	19.7	19.2	20.3	491.0	140	63	149.4	01 Sep 1928
		b	4.3	4.5	6.5	5.5	4.8	3.3	4.8	4.0	2.4	2.1	2.1	2.1	46.4	(1961)	(1970)		
Dachigam	17	a	47.5	72.6	133.4	124.1	105.0	46.8	92.4	121.0	65.2	49.9	16.8	25.5	900.2	134	64	71.4	10 Sep 1992
		b	4.9	7.7	9.4	9.4	8.7	4.3	7.6	7.9	4.0	3.6	1.6	3.5	72.6	(1966)	(1977)		
Kukernag	22	a	61.2	82.9	134.2	117.1	109.6	67.6	89.6	86.2	63.9	33.8	26.1	37.4	909.6	138	66	144.4	09 Sep 1966
		b	4.8	5.9	7.0	8.6	8.6	4.6	6.4	6.2	4.3	2.6	2.2	3.0	64.2	(1966)	(1971)		
Kukernag (Obsy)	21	a	83.8	121.2	172.2	109.4	119.5	78.3	99.6	83.5	45.3	44.3	46.8	66.4	1070.3	131	48	135.8	25 Feb 1987
		b	5.7	7.3	9.8	8.0	8.7	5.3	7.4	5.8	3.9	3.1	2.4	4.2	71.6	(1986)	(2000)		
Pahalgam	22	a	66.8	65.3	143.2	152.2	119.1	82.4	105.1	113.4	64.4	45.8	39.3	43.4	1040.4	199	41	137.5	06 Mar 1979
		b	7.1	7.4	10.5	11.3	10.0	7.6	9.5	10.1	6.3	4.4	3.7	4.9	92.8	(1972)	(1961)		
Pahalgam (obsy)	23	a	98.6	142.1	217.9	145.3	128.6	89.2	109.7	102.4	77.8	57.8	48.4	83.2	1301.0	118	71	137.5	06 Mar 1979
		b	8.2	8.9	11.9	10.0	9.8	8.2	9.3	9.0	6.4	4.4	3.4	5.3	94.8	(1994)	(2000)		
Verinagh Obsy	20	a	70.6	116.0	205.7	166.0	149.0	75.1	123.7	112.8	78.0	51.7	45.7	42.0	1236.3	148	62	231.2	01 Aug 1976
		b	5.2	8.0	9.6	8.7	8.7	4.6	8.2	6.1	5.1	3.6	2.6	3.3	73.7	(1975)	(1971)		
Anantanag (District)		a	66.9	91.8	157.0	124.4	111.9	67.3	94.9	94.7	60.3	43.3	34.6	45.5	992.6	155	49		
		b	5.7	7.1	9.2	8.8	8.5	5.4	7.6	7.0	4.6	3.4	2.6	3.8	73.7	1972	(1970)		

a : Normal rainfall in mm.

b : Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

* Based on all available data.

** Years of occurrence given in brackets.

TABLE - 2
FREQUENCY OF ANNUAL R/F IN THE DISTRICT
(DATA 1951 – 2000)
ANANTNAG

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS
401 - 500	1	1001 - 1100	6
501 - 600	1	1101 - 1200	5
601 - 700	2	1201 - 1300	6
701 - 800	3	1301 - 1400	3
801 - 900	4	1401 - 1500	2
901 - 1000	4	1501 - 1600	1

(Data available for 38 years)

TABLE – 3
Normals of Temperature and Relative Humidity
(KUKERNAG)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity %	
	°C	°C	°C	Date	°C	Date	0830 IST	1730 IST
January	4.1	-4.3	17.2	31.01.2001	-15.3	22.01.1991	87	80
February	7.0	-2.1	18.0	01.02.2001	-12.3	22.02.1984	83	73
March	11.9	2.0	29.2	26.03.2001	-6.7	09.03.1979	73	64
April	18.5	6.3	28.3	30.04.2007	-1.0	03.04.1999	63	55
May	22.6	9.5	32.6	15.05.2001	-0.3	01.05.2004	62	55
June	26.7	13.3	34.9	25.06.2005	4.2	02.06.1999	59	50
July	27.2	16.1	33.0	08.07.1993	9.2	05.07.2009	73	65
August	27.1	15.3	31.8	20.08.1998	9.1	23.08.1981	75	67
September	25.1	11.4	31.2	08.09.1998	4.4	30.09.1982	65	60
October	20.2	6.6	29.4	01.10.2009	-1.8	26.10.2009	60	57
November	13.4	2.1	23.4	06.11.1998	-5.0	25.11.2007	66	67
December	7.5	-1.7	18.4	08.12.1993	-10.5	19.12.1986	79	74
Annual	17.7	6.4	34.9	25.06.2005	-15.3	22.01.1991	70	64

TABLE – 4
Mean Cloud Amount ** (Okta of the Sky) and Mean Number
Of days of Clear and Overcast Skies
(KUKERNAG)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	5	3	4	10	9	15	4	5	13	18	14	8	108
b	14	12	12	7	6	2	6	5	3	3	5	10	85
c	5.4	5.4	5.2	3.7	3.3	2.1	4.4	4	2.4	1.9	2.9	4.5	3.8
1730 HOURS IST													
a	5	2	2	3	2	5	2	2	6	9	10	7	55
b	12	9	11	8	7	3	4	3	2	3	5	9	76
c	4.9	5.1	5.3	4.8	4.7	3.3	4.2	4	3.1	2.7	3.1	4.4	4.1

- a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** Okta = Unit equal to area of one eighth of the sky used in specifying cloud amount.
For example: 1 Okta means 1/8th of the sky covered.

TABLE - 5
Mean Wind Speed and Predominant Wind Direction
(KUKERNAG)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind Speed in km/hr	2.7	3.2	3.8	4.2	3.6	3.8	2.8	2.8	3.4	4.6	4.0	2.8	3.5
Direction in morning	SE/C	SE/C	SE	SE	C/SE	C/SE	C/SE	C/SE	SE/C	SE	SE	C/SE	
Direction in evening	C/SE/ NW	C/NW/ SW	C/NW/ SE	C/SE/ NW	C/SE/ NW	C/SE/ NW	C/SE/ NW	C/SE/ NW	C/SE/ SW	C/SE	C/SE	C	

TABLE - 6
Special Weather Phenomena
(KUKERNAG)

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.1	0.6	2.5	4.0	6.1	4.4	4.4	3.6	2.7	1.5	0.3	0.4	30.6
Hail	0.1	0.1	0.1	0.4	0.2	0.2	0.2	0.0	0.1	0.2	0.0	0.0	1.6
Dust-storm	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1
Fog	0.8	0.5	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.5	2.5
Squall	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TABLE – 3(a)
Normals of Temperature and Relative Humidity
(PAHALGAM)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity %	
	°C	°C	°C	Date	°C	Date	0830 IST	1730 IST
January	3.7	-7.9	13.2	19.01.2010	-18.6	10.01.1986	89	84
February	5.9	-5.9	17.0	28.02.1995	-17.3	24.02.1984	90	78
March	10.4	-1.1	23.5	18.03.2004	-11.6	01.03.1995	84	70
April	17.1	2.8	27.4	28.04.1979	-4.2	02.04.1995	74	60
May	20.6	5.5	30.8	23.05.2000	-1.0	28.05.1988	72	58
June	24.6	8.1	32.0	25.06.1990	1.5	05.06.1999	73	56
July	25.4	12.1	31.5	10.07.1999	2.0	03.07.1991	84	65
August	25.5	12.2	32.2	02.08.1990	4	14.08.1982	89	67
September	23.7	8.1	30.0	06.09.2005	0.6	28.09.2000	86	61
October	19	2.3	27.7	02.10.2009	-5.1	31.10.1984	82	59
November	12.4	-1.6	23.0	01.11.2000	-10.8	15.11.1978	85	68
December	6.7	-4.4	15.2	01.12.2002	-15.7	31.12.1986	89	75
Annual	16.3	2.8	32.2	02.08.1990	-18.6	10.01.1986	83	67

TABLE – 4(a)
Mean Cloud Amount ** (Okta of the Sky) and Mean Number
Of days of Clear and Overcast Skies
(PAHALGAM)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	8	7	8	11	12	14	4	4	12	20	16	13	129
b	14	12	14	7	6	3	7	6	3	2	6	8	88
c	4.7	4.8	4.7	3.6	3.4	2.3	4.2	3.9	2.6	1.8	2.6	3.7	3.5
1730 HOURS IST													
a	4	2	1	2	1	3	1	1	3	9	12	9	48
b	16	14	15	11	11	5	7	6	4	4	6	10	109
c	5.4	5.8	6	5.5	5.3	4.3	4.9	4.7	4	3.1	3.3	4.2	4.7

TABLE – 5(a)
Mean Wind Speed and Predominant Wind Direction
(PAHALGAM)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind Speed in km/hr	Data not available												
Direction in morning	C	C	C/NE	C/N/S	C/S	C	C	C	C	C	C	C	C
Direction in evening	C/S/ SW	C/SW/ W/S	C/SW/ SE/SW	C/SW/ W/S	C/SW/ S	C/SW/ S	C/SE/ SW/S	C/SW/ SE/S	C/SW/ SE/SW	C/SW	C/SW/ W	C	

TABLE – 6(a)
Special Weather Phenomena
(PAHALGAM)

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.0	0.1	1.8	4.6	9.1	9.1	6.6	6.0	4.9	1.8	0.2	0.3	44.5
Hail	0.0	0.0	0.1	0.3	0.2	0.0	0.1	0.2	0.1	0.1	0.0	0.0	1.1
Dust-storm	0.0	0.0	0.0	0.1	0.3	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.6
Fog	0.8	0.5	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.5	2.5
Squall	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

BADGAM DISTRICT

The topography of Badgam district is mixed with both mountainous and valleys with forest. The southern and southwestern parts are mostly hilly, while the eastern, central and northern parts of the district are of low elevation with valleys. The average height of the mountains is 1,610 metres above mean sea level and peak height in the district is about 3800 metres and the area under forest cover is 477 sq. km out of total areas about 1371 sq. km.

The climate is of the temperate cum mediterranean type. In the higher reaches the climate is cold with the snowfall in winter. Winter starts from the middle of November when both day and night temperatures fall rapidly till mid-February, and lasts till mid-March. The temperatures start to rise from March and continue till August. March to the end of June is the summer season, followed by southwest monsoon season till September. Heavy rain occasionally occurs in the summer months which are pleasant. The period of October to mid-November constitutes transition period (post monsoon season) between the monsoon season and winter.

RAINFALL

Records of rainfall in the district are available for three rain gauge stations for period ranging from 21 to 30 years. The details of rainfall at these stations and for the district as a whole are given in Tables 1 and 2. The average annual rainfall in the district is 673.4 mm. The rainfall in the southwest monsoon season (June to September) is about 28% of the annual normal rainfall, while the rainfall in the pre monsoon months (March to May) account for 41% of the annual, March being the month with the highest rainfall with an average value of 107.4 mm. The winter months (December to February) contribute rainfall of about 23% of the annual normal. In the period 1959 to 2000, the highest annual rainfall was 184% of the normal recorded in 1992, while the lowest was 49% of the normal recorded in 1971. During this period, there were 4 years in which the rainfall was less than 80% of the normal and out of which two years were consecutive. It is seen from Table 2 that

annual rainfall was between 501 mm and 900 mm in 19 years out of 24. Considerable amount of precipitation in the district in the form of snowfall is received in the months of November to March.

On an average there are 56 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 54 at Badgam to 57 at Arizal and Chari Sharif.

The heaviest rainfall recorded in 24 hours at any station in the district was 305.1 mm at Badgam on 11th September 1941.

TEMPERATURE

Badgam town is the headquarters of the district at an elevation of 2080 metres. There is no meteorological observatory in the district hence the meteorological parameters recorded at Pahalgam observatory at an elevation of about 2310 metres in the neighbouring Anantnag district. Temperature and other meteorological conditions vary depending much on the topography of the place. The cold season is from the middle of November to mid-March. Temperatures begin to decrease from November till mid-February. January is the coldest month with mean maximum temperature of about 5°C and mean minimum temperature of about -7°C at Badgam town. In association with cold waves, the minimum temperature may sometimes drop to below -15°C on individual days. The day and night temperatures both begin to rise from March and continue till July or August, while the day temperature reaches its highest in July and August which are the hottest months with mean maximum temperature of about 27°C and a mean minimum temperature is of about 13°C. On some days, during the period April to August the maximum temperature may sometimes reach 33°C. Both the temperatures are 5°C to 10°C lower over the places situated at high altitudinal areas and 4°C to 5°C high in valleys and low elevated areas in the district. The period of April to June and October to November is of pleasant with cool atmosphere.

HUMIDITY

The atmosphere over the district is generally humid throughout the year. It is slightly less humid during April to June and September to November especially in the afternoons when relative humidity is about 50% to 65%. In other months humidity is around 70% to 90%.

CLOUDINESS

The skies are heavily clouded to overcast during winter months December to March, thereafter cloudiness decreases and skies are moderately clouded till June. In months of July and August skies are overcast on some days. The hill tops are frequently enveloped with clouds. In the winter season sky sometimes becomes obscured in the mornings due to lifted fog which clears with the advance of the day.

WINDS

Winds are generally light throughout the year but sometimes it becomes moderate and strong. They mostly blow from the southeast direction throughout the year. Northwesterly and southwesterly components are also seen in the afternoons. Calm conditions are also experienced on many occasions. The district being hilly, local winds such as anabatic and katabatic winds affect to the speed and direction of wind at places.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year. During western disturbances thunderstorms are mostly observed. Sometimes precipitation occurs in form of snow and hails. Its frequency is more in the period; April to July and reduces post July with the activity being least in the winter months November to March. Thunderstorms occasionally occur along with hail during January to October. There is no dust storm in the district. Fog is common during the winter months.

**TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
BADGAM**

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Arizal	21	a	55.5	55.5	103.8	91.9	86.8	35.3	50.6	59.2	47.2	39.7	24.3	32.0	681.8	240	36	174.0	22 Jul 1988
		b	4.5	5.5	9.0	8.0	7.0	3.2	4.3	4.3	3.0	3.6	2.3	2.8	57.5	(1992)	(1971)		
Badgam	28	a	49.8	61.0	92.7	76.9	64.5	26.8	50.3	50.0	29.0	28.9	28.0	25.5	583.4	148	68	305.1	11 Sep 1941
		b	5.1	5.5	7.4	7.0	5.9	3.0	5.4	4.8	2.7	2.6	2.2	2.8	54.4	(1966)	(1974)		
Chari Sharif	30	a	64.4	84.5	125.8	96.2	86.6	44.0	65.6	56.9	44.0	29.6	30.5	26.7	754.8	189	55	193.3	08 Sep 1992
		b	4.7	5.6	7.9	7.5	6.8	3.9	5.6	4.7	2.9	2.2	2.5	2.8	57.1	(1992)	(1971)		
District Mean		a	56.6	67.0	107.4	88.3	79.3	35.4	55.5	55.4	40.1	32.7	27.6	28.1	673.4	184	49		
		b	4.8	5.5	8.1	7.5	6.6	3.4	5.1	4.6	2.9	2.8	2.3	2.8	56.4	(1992)	(1971)		

a : Normal rainfall in mm.

b : Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

* Based on all available data.

** Years of occurrence given in brackets

TABLE - 2
FREQUENCY OF ANNUAL R/F IN THE DISTRICT
(DATA 1959 - 2000)
BADGAM

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS
301 - 400	2	801 - 900	2
401 - 500	2	901 - 1000	0
501 - 600	3	1001 - 1100	0
601 - 700	11	1101 - 1200	0
701 - 800	3	1201 - 1300	1

(Data available for 24 years)

BANDIPORA DISTRICT

Bandipora district has high mountain (Harmukh mountain) and valleys and is situated in Himalayas. The district headquarter Bandipora is situated at an altitude of about 1703 metres above mean sea level on the northeastern bank of the Wullar lake. In the district altitude varies from 1,700 metres to 4870 metres above mean sea level where temperature is very low with precipitation in winter months. The district has a severe cold climate in winter and pleasant weather in summer. The northern and central parts of the district are mostly snow covered for about seven months (October to April).

The winter is cold and commences from November and lasts till mid-March. In higher mountains winter is very cold with snowfall. Temperatures are low during summer also. The pre-monsoon (summer) season from the middle of March to the end of June is of moderate temperature, followed by southwest monsoon season till September. The moderate rain occasionally occurs in the summer months. October constitutes the transition period between the monsoon and winter.

RAINFALL

Records of rainfall in the district are available for only one raingauge station at Bandipora for a period of 24 years. The details of rainfall at this station which may be taken as representative for the district as a whole are given in Tables 1 and 2. The average annual rainfall in the district is 686.4 mm. The annual rainfall in the district varies over a small range. The rainfall in southwest monsoon season (June to September) is about 23% of the annual normal rainfall, while the rainfall in pre-monsoon months (March to May) account for 39% of the annual, March being the month with the highest rainfall with an average value of 119.6 mm. The winter months (December to February) contribute about 28% of the annual normal rainfall. In the period 1951 to 1994, the highest annual rainfall of 146% of the normal was recorded in year 1961, while the lowest was 47% of the normal recorded in 1964. During this period, there were 5 years in which the rainfall was less than 80% of the normal and there was one occasion of three consecutive years of such low rainfall. It

is seen from Table 2 that annual rainfall was between 501 mm and 900 mm in 13 years out of 19.

In the district especially in higher mountains, considerable amount of precipitation is received in the form of snow. Snowfall mainly occurred in the winter months November to March. About 75% of snowfall occurred in January to March.

On an average there are 62 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district.

The heaviest rainfall recorded in 24 hours at Bandipora was 129.0 mm on 20th February 1984.

TEMPERATURE

There is no meteorological observatory in the district hence the meteorological parameters recorded at Srinagar observatory at an elevation of approximately 1587 metres in the neighbouring district may be taken as representative for this district. Temperature and other meteorological conditions depend very much on the topography of the place. The cold season is from mid-November to mid-March. Temperatures at Bandipora town begin to decrease from November and January is the coldest month with mean maximum temperature of about 5°C and mean minimum temperature of about -3°C. In association with cold waves, the minimum temperature may sometimes drop to below -20°C on individual days. The day and night temperature begin to rise from March and continue till July. July is the hottest month with mean maximum temperature of about 29°C and mean minimum temperature is about 17°C. On some days during the period April to August the maximum temperature may sometimes reach 35°C. The day and night temperature in monsoon months are more than summer months. Both the temperatures are 10°C to 15°C lower at the places situated at higher altitudes in surrounding lofty mountains.

HUMIDITY

The atmosphere over the district especially in the morning is generally humid throughout the year. The period from November to March is more humid when the values of relative humidity are about 90% in the mornings while it is slightly less humid during April to October especially in the afternoons when relative humidity is of about 50%.

CLOUDINESS

The skies are moderately clouded to overcast on many days in the period from December to May. In the winter season, the skies sometimes are obscured in the morning due to lifted fog which clears with the advance of day. Cloudiness decreases slightly thereafter and skies are lightly clouded in the remaining months.

WINDS

Winds are generally light and they mostly blow from the southeast direction in the mornings and from the northwest direction in the afternoons throughout the year. On other occasions especially calm conditions generally prevail. Also sometimes strong winds blow during pre-monsoon months along with thunderstorms.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year. Its frequency is more in the period April to July and reduces post July with the activity being least in winter months November to March. Hail is rather rare and confined to the period April to June. Fog is common almost throughout the year with its occurrence being more during the winter months.

**TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
BANDIPORA**

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Bandipora	24	a	66.1	95.5	119.6	85.7	63.7	27.8	44.3	56.0	32.7	38.0	24.0	33.0	686.4	146	47	129.0	20 Feb1984
		b	6.6	8.2	8.9	7.3	5.8	2.8	5.1	4.9	3.1	3.0	2.7	3.6	62.0	(1961)	(1964)		
Bandipora (District)		a	66.1	95.5	119.6	85.7	63.7	27.8	44.3	56.0	32.7	38.0	24.0	33.0	686.4	139	47		
		b	6.6	8.2	8.9	7.3	5.8	2.8	5.1	4.9	3.1	3.0	2.7	3.6	62.0	(1972)	(1964)		

a: Normal rainfall in mm.

b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

* Based on all available data.

** Years of occurrence given in brackets.

TABLE - 2
FREQUENCY OF ANNUAL R/F IN THE DISTRICT
(DATA 1951 - 2000)
BANDIPORA

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS
301 - 400	2	701 - 800	2
401 - 500	2	801 - 900	3
501 - 600	5	901 - 1000	2
601 - 700	3	1001-11001	1

(Data available for 20 years)

BARAMULLA DISTRICT

Baramulla district lies in western sector of Kashmir valley with hilly terrain having an average elevation of 1590 metres above mean sea level. The district is surrounded by snow clad mountains of elevation up to 5000 metres. It is the largest district in the entire Kashmir valley both with reference to the area and population. Baramulla district has distinction of having geographical diversity as it has sub-temperate / sub-tropical climatic areas. It has a severe cold weather in winter while summers are pleasant. All parts of the district mostly experience snowfall during winter.

Winter starts from the middle of November when both the day and night temperatures fall rapidly till mid-February, and lasts till early March. The temperatures start to rise from March and remain steady till August. The period of March to the end of June is of summer season. The moderate rain generally occurs during the summer months. This is followed by southwest monsoon season till September. The period of October to mid-November constitutes the post monsoon season.

RAINFALL

Records of rainfall in the district are available for six raingauge stations for period ranging from 14 to 36 years. The details of rainfall at these stations and for the district as a whole are given in Tables 1 and 2. The average annual rainfall in the district is 1098.6 mm. The annual rainfall in the district varies over a large range. There is a large variation in annual rainfall from year to year also. The rainfall in the southwest monsoon season (June to September) is about 23% of the annual normal rainfall, while the rainfall in the pre-monsoon months (March to May) account for 39% of the annual, March being the month with the highest rainfall with an average of 183.6 mm. The winter months (December to February) contribute rainfall for about 30% of the annual normal rainfall. In the fifty-year period 1951 to 2000, the highest annual rainfall of 184% of the normal was recorded in year 1998, while the lowest was 22% of the normal recorded in 1970. During this period, there were 15 years in

which the rainfall was less than 80% of the normal and there were two occasions of two consecutive years and one occasion of 6 consecutive years of such low rainfall. It is seen from Table 2 that annual rainfall was between 801 mm and 1400 mm in 19 years out of 41.

In the district especially in higher mountains, a considerable amount of precipitation is received in the form of snow. About 117 cm snowfall occurred annually in the district. About 40% of snowfall is received in the months of February and March.

On an average there are 70 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 49 at Durroo to 102 at Gulmarg Observatory.

The heaviest rainfall recorded in 24 hours at any station in the district was 406.4 mm at Sopore on 19th January 1954.

TEMPERATURE

There is one meteorological observatory in the district at Gulmarg at an elevation of approximately 2600 metres. Baramulla town is headquarters of the district at an elevation of about 1572 metres. The peak height in the district is about 3750 metres above mean sea level. Temperature and other meteorological conditions depend very much on the topography of the place. So the description of climate that follows is based on the records of meteorological parameters recorded at this observatory which may be taken as representative of the district. The cold season is from mid-November to early March. January is the coldest month with mean maximum temperature of about 0.7°C and mean minimum temperature of about -7.9°C at Gulmarg observatory. These temperatures are about 6°C and -2.0°C respectively for Baramulla town. In association with cold waves, the minimum temperature may sometimes drop to below -19°C on individual days near Gulmarg observatory. The day and night temperatures both begin to rise from March and

continue till July and remain more or less equal in August. July is the hottest month with mean maximum temperature of about 20.6°C and mean minimum temperature is 11.7°C at Gulmarg observatory and about 30°C and 18°C respectively for Baramulla. Monsoon months are warmer than the summer months. On individual days, during the period May to July the maximum temperature may sometimes reach 29°C. The temperature may be lower by 4°- 8°C in high altitudinal areas and 5°- 10°C high in low elevated areas (valleys) as compared to Gulmarg. The period of April to June and October to November is of pleasant with cool atmosphere.

The highest maximum temperature ever recorded at Gulmarg observatory was 29.4°C on 14 July 1918 and 20th June 1922 and the lowest minimum temperature ever recorded was -19.8°C on 4th January 1991.

HUMIDITY

The atmosphere over the district is generally humid throughout the year. It is slightly less humid during April to June and September to November especially in the afternoons when relative humidity is of about 60% to 70% but in other months humidity is around 80%.

CLOUDINESS

The skies are very lightly clouded throughout the year. Skies are clouded on many days in the period December to May. Thereafter, cloudiness decreases slightly and skies are lightly clouded in the period from June to November.

WINDS

Winds are generally light and westerly winds are predominant throughout the year. Sometimes it becomes moderate and strong. The district being hilly and mountainous local winds such as anabatic and katabatic winds determine the speed and direction of wind at places.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year. Its frequency is more in the period April to July and reduces post July with the activity being least in the period from November to February. Hail is rather rare and confined to the period April to June. Fog is common almost throughout the year with its occurrence being more during the period from December to May.

Table 3, 4, 5 and 6 give the temperature and humidity, cloudiness, predominant wind direction and special weather phenomena respectively for Gulmarg observatory.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
BARAMULLA

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Baramulla	30	a	56.5	101.9	137.9	120.8	73.5	36.2	42.5	40.1	34.0	35.9	23.5	34.4	737.2	165	47	88.9	02 Aug 1956
		b	4.1	7.1	8.8	8.4	6.2	4.0	4.0	3.4	2.2	2.4	2.2	3.0	55.8	(1954)	(1974)		
Durroo	14	a	122.2	73.4	154.7	124.4	100.0	63.9	78.8	48.6	89.2	36.3	49.0	58.6	999.1	132	66	217.2	25 Sep 1954
		b	4.6	3.5	7.9	6.8	5.7	3.1	3.7	3.7	2.8	1.5	2.3	2.9	48.5	(1956)	(1960)		
Gulmarg (Obsy)	35	a	200.9	271.8	309.8	197.7	154.1	85.2	113.2	121.8	59.2	63.8	47.3	145.8	1770.6	114	62	236.2	05 Jul 1959
		b	10.0	10.9	13.9	12.1	10.6	7.3	8.7	9.0	5.3	4.9	3.1	6.0	101.8	(1998)	(2000)		
Gulmarg (R.S. Obsy)	36	a	153.9	242.7	258.5	181.4	149.9	94.4	108.4	100.0	58.6	62.6	46.7	113.7	1570.8	165	77	293.4	20 Feb 1967
		b	8.4	10.3	12.3	11.0	10.9	7.9	9.7	8.6	5.1	4.1	2.9	5.7	96.9	(1967)	(1968)		
Sopore	30	a	103.2	116.5	146.6	116.7	70.3	26.8	39.2	47.7	37.3	44.5	29.9	26.3	805.0	283	49	406.4	19 Jan 1954
		b	5.2	6.8	9.1	7.9	6.2	2.8	3.6	4.1	2.8	2.9	2.0	2.7	56.1	(1954)	(1971)		
Tangmarg	25	a	63.9	67.1	93.9	106.3	97.8	51.3	51.7	43.0	45.6	31.0	28.5	27.7	707.8	209	29	170.0	3 Feb 1974
		b	4.0	5.8	7.6	9.7	8.3	4.6	4.6	4.5	3.1	3.0	2.9	3.0	61.1	(1992)	(1971)		
Baramulla (District)		a	116.8	145.6	183.6	141.2	107.6	59.6	72.3	66.9	54.0	45.7	37.5	67.8	1098.6	184	22		
		b	6.0	7.4	9.9	9.3	8.0	5.0	5.7	5.6	3.5	3.1	2.6	3.9	70.0	(1998)	(1970)		

a: Normal rainfall in mm.

b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

* Based on all available data.

** Years of occurrence given in brackets.

TABLE - 2
FREQUENCY OF ANNUAL R/F IN THE DISTRICT
(DATA 1951 – 2000)
BARAMULLA

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS
201 - 300	2	1201 - 1300	2
301 - 400	1	1301 - 1400	1
401 - 500	1	1401 - 1500	3
501 - 600	3	1501 - 1600	2
601 - 700	3	1601 - 1700	0
701 - 800	2	1701 - 1800	1
801 - 900	5	1801 - 1900	1
901 - 1000	6	1901 - 2000	2
1001 - 1100	4	2001 - 2100	1
1101 - 1200	1		

(Data available for 41 years)

TABLE-3
Normals of Temperature and Relative Humidity

(GULMARG)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity %	
	°C	°C	°C	Date	°C	Date	0830 IST	1730 IST
January	0.7	-7.9	11.5	08/01/1971	-19.8	04/01/1991	80	78
February	1.1	-7.4	11.4	11/02/1993	-18.0	04/02/1968	82	78
March	4.5	-3.6	17.4	20/03/1974	-14.8	08/03/1979	81	75
April	10.5	1.5	22.0	28/04/1979	-8.7	06/04/1967	71	66
May	14.9	5.3	28.0	11/05/2000	-2.1	04/05/1992	70	64
June	20.0	9.3	29.4	20/06/1922	-3.9	13/06/1935	64	59
July	20.6	11.7	29.4	14/07/1918	2.8	02/07/2007	78	74
August	20.4	11.4	27.6	11/08/1969	2.7	29/08/1951	80	75
September	18.7	7.9	25.4	07/09/1987	-2.8	30/09/1940	71	65
October	14.2	3.2	21.8	01/10/1998	-6.5	30/10/1982	60	56
November	9.1	-1.2	20.0	02/11/1999	-10.0	29/11/1996	63	61
December	4.5	-5.0	15.8	01/12/1999	-14.0	30/12/1994	71	69
Annual	11.8	2.3	29.4	20/06/1922	-19.8	04/01/1991	72	68

TABLE – 4
**Mean Cloud Amount *(Okta of the Sky) and Mean Number
of days of Clear and Overcast Skies
(GULMARG)**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	3	2	2	5	5	7	1	1	6	16	16	13	77
b	16	15	16	5	4	2	5	4	3	2	3	5	80
c	5	5	5	4.2	3.7	2.6	4.7	4.3	2.8	2.1	2.9	4.2	3.9
1730 HOURS IST													
a	2	1	0	0	0	1	0	0	0	2	4	2	12
b	5	13	15	6	6	3	4	3	2	2	2	4	65
c	4.6	5.1	5.5	5.3	5.1	4.3	4.6	4.6	3.7	3.3	3.4	4.3	4.5

- a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** Okta = Unit equal to area of one eighth of the sky used in specifying cloud amount.
For example: 1 Okta means 1/8th of the sky covered.

TABLE - 5
**Mean Wind Speed and Predominant Wind Direction
(GULMARG)**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind Speed in km/hr	Data not available												
Direction in morning	w	w	w	w	w	w	w	w	w	w	w	w	
Direction in evening	w	w	w	w	w	w	w	w	w	w	w	w	

TABLE - 6
**Special Weather Phenomena
(GULMARG)**

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.3	0.2	2.8	6.7	11.3	9.2	6.4	4.7	4.5	2.9	0.5	0.1	49.7
Hail	0.0	0.0	0.0	0.1	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.6
Dust-storm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fog	4.5	3.2	4.4	3.0	3.3	1.0	2.2	1.3	1.0	1.4	2.1	2.9	30.2
Squall	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DODA DISTRICT

Doda district has hilly terrain with the elevation up to 5600 metres above mean sea level and lies in the middle Himalayan ranges. The entire district is hilly with a few plain and valleys with low lying areas. The district does not have a uniform climate due to its varying physical features. It is surrounded by snow clad lofty mountains and mighty river Chenab flows through it. The climate is temperate in the high altitudinal areas of the district while it is sub-tropical in the southern part. It has a severe cold weather in winter. Snowfall is common at high altitudinal areas during winter. Winter starts from the middle of November when both the day and night temperatures fall rapidly till January or mid-February, and lasts till early March. The temperatures start to rise from March to July. The period of mid-November to early March is of winter season while March to the end of June is of summer season followed by southwest monsoon season till September. Summers are pleasant which are associated with the rain. The period of October and mid-November constitutes the post monsoon season.

RAINFALL

Records of rainfall in the district are available for only one raingauge station for period 24 years. The details of rainfall at this station and for the district as a whole are given in Tables 1 and 2. The average annual rainfall in the district is 1334.5 mm. The rainfall in southwest monsoon season (June-September) is about 33% of the annual normal rainfall, while the rainfall in pre-monsoon months (March to May) accounts for 33% of the annual rainfall, March being the month of the highest rainfall with an average of 213.5 mm. The winter months (December to February) account for about 27% of the annual rainfall. In the period 1960 to 2000, the highest annual rainfall of 136% of the normal was recorded in year 1988, while the lowest was 62% of the normal recorded in 1999. During this period, there were 2 years in which the rainfall was less than 80% of the normal and which were also consecutive years. It is seen from Table 2 that annual rainfall was between 1001 mm and 1600 mm in 11 years out of 16.

In the district especially in higher mountains, considerable amount of precipitation is received in the form of snow. About 64 cm of snowfall occurs annually in the district. Snowfall mainly occurs in the winter months November to March. About 75% of snowfall occurs in December & February.

On an average there are 81 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district.

The heaviest rainfall recorded in 24 hours at any station in the district was 170.2 mm at Badarwah observatory on 5th September 1995.

TEMPERATURE

There is one meteorological observatory in the district at Badarwah at elevation of approximately 1688 metres. The peak height in the district is about 5600 m. Temperature and other meteorological conditions depend very much on the topography of the place. The description of climate that follows is based on the records of meteorological parameters recorded at this observatory which may be taken as representative of the district. The cold season is from the middle of November to early March. Temperatures begin to decrease from mid-November till January or mid-February. January is the coldest month with mean maximum temperature of about 11.6°C and mean minimum temperature of about -1.9°C. In association with cold waves, the minimum temperature may sometimes drop to below -10°C on individual days. The day and night temperatures both begin to rise from the middle of March and continue till July, while the day temperature reaches its highest in July which is the hottest month with mean maximum temperature of about 31°C whereas mean minimum temperature of July is about 16.5°C. The period of April to June and October is of pleasant with cool atmosphere. On some days, during the period May to August the maximum temperature reaches 37°C. The temperatures may be 10° - 20°C lower at high elevated areas with reference to Badarwah.

The highest maximum temperature ever recorded at Badarwah observatory was 39.4°C on 12th July 1999 while the lowest minimum temperature ever recorded was –10.8°C on 3rd January 1991.

HUMIDITY

The atmosphere over the district is generally humid throughout the year. It is slightly less humid during April to June and September to December especially in the afternoons when relative humidity is of about 50% to 60% but in other months humidity is around 65% in the afternoon. In the mornings relative humidity is at about 63 to 81% throughout the year.

CLOUDINESS

The skies are generally clouded throughout the year. Skies are heavily clouded on many days in the period of January to March. Cloudiness decreases slightly thereafter and cloudiness again increases from July. Cloudiness is the least in the post monsoon months; October and November. In the winter season, the skies are sometimes obscured in the morning due to lifted fog which clears with the advance of the day.

WINDS

Winds are generally light and calm throughout the year. Sometimes winds become moderate and strong, as anabatic and katabatic winds blow over hilly terrain and play a dominant role. Southeasterly component is seen in the mornings from the period September to March. Northeasterly component is also observed in district in the mornings from the period March to September. Northerly/northeasterly and Southeasterly/southwesterly components are seen in the afternoons.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year. Its frequency is more in the period March to July and reduces post July with the activity being least in the winter months November to March. Thunderstorms occur during the period March to September are along with hail. Fog is mostly common in the winter months but it is common almost throughout year in hilly terrain.

Table 3, 4, 5 and 6 give the temperature and humidity, cloudiness, mean wind speed and predominant wind directions and special weather phenomena respectively for Badarwah observatory.

**TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
DODA**

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Badarwah (Obsy)	24	a	119.3	162.5	213.5	128.4	100.2	72.7	146.3	126.1	96.6	40.9	43.8	84.2	1334.5	136	62	170.2	05 Sep 1995
		b	7.0	8.3	9.5	7.4	7.9	6.6	10.0	9.1	5.1	2.7	2.7	4.3	80.6	(1988)	(1999)		
Doda (District)		a	119.3	162.5	213.5	128.4	100.2	72.7	146.3	126.1	96.6	40.9	43.8	84.2	1334.5	136	62		
		b	7.0	8.3	9.5	7.4	7.9	6.6	10.0	9.1	5.1	2.7	2.7	4.3	80.6	(1988)	(1999)		

a: Normal rainfall in mm.

b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

* Based on all available data.

** Years of occurrence given in brackets.

TABLE - 2
FREQUENCY OF ANNUAL R/F IN THE DISTRICT
(DATA 1960- 2000)
DODA

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS
801 - 900	1	1401 - 1500	1
901 - 1000	1	1501 - 1600	2
1001 - 1100	2	1601 - 1700	2
1101 - 1200	1	1701 - 1800	0
1201 - 1300	2	1801 - 1900	1
1301 - 1400	3		

(Data available for 16 years)

TABLE – 3
Normals of Temperature and Relative Humidity
(BADARWAH)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity %	
	°C	°C	°C	Date	°C	Date	0830 IST	1730 IST
January	11.6	-1.9	21.8	14.01.2002	-10.8	03.01.1991	79	66
February	12.4	-0.7	24.8	10.02.1993	-9.2	23.02.1984	81	66
March	16.8	2.4	29.7	17.03.2004	-6.5	09.03.1979	77	61
April	23.3	6.6	32.6	30.04.1999	-2.5	13.04.1983	65	50
May	27.0	9.4	37.6	30.05.2000	0.2	13.05.1982	63	52
June	31.0	13.6	39.3	10.06.2002	5.2	04.06.1992	63	50
July	30.4	16.5	39.4	12.07.1999	7.0	07.07.1983	77	65
August	30.1	16.0	37.2	11.08.2002	8.1	25.08.1996	81	68
September	28.6	11.8	35.1	01.09.2001	2.5	25.09.1982	76	59
October	24.6	6.3	32.4	06.10.2000	-3.0	18.10.1990	71	52
November	19.8	2.7	28.7	15.11.2001	-2.5	30.11.1986	69	57
December	14.7	0.0	22.9	01.12.2008	-6.5	31.12.1991	68	59
Annual	22.7	7.1	39.4	12.07.1999	-10.8	03.01.1991	73	59

TABLE - 4
Mean Cloud Amount ** (Okta of the Sky) and Mean Number Of days
of Clear and Overcast Skies
(BADARWAH)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	12	8	8	12	14	14	3	4	13	22	19	14	143
b	8	8	10	5	5	3	10	7	3	1	3	5	68
c	3.7	4.2	4.3	3.0	2.7	2.3	4.7	4.3	2.5	1.2	1.8	2.9	3.1
1730 HOURS IST													
a	8	5	3	3	3	2	1	1	4	13	15	13	71
b	10	9	11	9	7	4	7	6	4	2	3	5	77
c	4.0	4.8	5.3	4.8	4.7	4.0	4.9	4.8	3.6	2.1	2.2	3.1	4.0

a: Days with clear sky.

b: Days with sky overcast.

c: Mean cloud amount in Okta.

** Okta = Unit equal to area of one eighth of the sky used in specifying cloud amount.
 For example: 1 Okta means 1/8th of the sky covered.

TABLE - 5
Mean Wind Speed and Predominant Wind Direction
(BADARWAH)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind speed in km/hr.	2.2	2.3	2.6	2.6	2.1	2.0	1.3	1.2	1.6	2.0	2.1	2.1	2.0
Direction in morning	C/SE	C/SE	C/NE/SE	C/NE/N	C/NE	C/NE/N	C/NE	C/NE	C/NE/SE	C/SE	C/SE	C/SE/NE	
Direction in evening	C/NE/SE	C/NE/N/SE	C/NE/N/SE/SW	C/N/SW/NW	C/N/NE/NW	N/C/NE/NW	C/N/NE	C/N/NE	C/SW/N/NE	C/SW/NE/N	C/N/NE/NW	C/NE	

TABLE - 6
Special Weather Phenomena
(BADARWAH)

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.3	0.7	2.7	4.0	6.3	4.7	2.7	1.9	2.3	1.0	0.4	0.1	27.1
Hail	0.0	0.0	0.4	0.2	0.1	0.2	0.1	0.0	0.1	0.0	0.0	0.0	1.1
Dust-storm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fog	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Squall	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

GANDERBAL DISTRICT

Ganderbal district is located in the Kashmir valley. The district has hilly terrain and valleys. Nallah Sindh, a major tributary to the Jhelum river flows through this district, which is the major source of irrigation and hydro-electricity in the district. Altitude in the district generally varies from 1,600 metres to 5,186 metres above mean sea level where coolness, precipitation, snowfall and pleasant summer are experienced over the places in the district. As such there is a wide variation in climatic conditions in the district due to topography. The district experiences snowfall and severe cold in winter and tropical climate at low altitude. The winter is cold and commences from November and lasts till mid-March. Winter is very cold with snowfall. The pre-monsoon / summer season from mid-March to June is of moderate temperature and moderate summer which is followed by southwest monsoon season till September. Heavy rainfall occurs during winter and summer months. When the monsoon is strong, rain is caused. October month is of a transition period between the monsoon season and winter.

RAINFALL

Records of rainfall in the district are available for four raingauge stations for period ranging from 18 to 31 years. The details of rainfall at these stations and for the district as a whole are given in Tables 1 and 2. The average annual rainfall in the district is 1002.8 mm in the form of snow and rain. The annual rainfall in the district varies over a large range. The rainfall in the southwest monsoon season (June to September) is about 28% of the annual normal rainfall, while the rainfall in the pre-monsoon months (March to May) accounts for 35% of the annual, March being the month with the highest rainfall with an average of 126.1 mm. The winter months (December to February) contribute rainfall about 27% of the annual normal rainfall. In the period of 1951 to 1994, the highest annual rainfall of 209% of the normal was recorded in year 1956, while the lowest was 38% of the normal recorded in 1960. During this period, there were 13 years in which the rainfall was less than 80% of the normal and there were one occasion each of two, three and four consecutive years

of such low rainfall. It is seen from Table 2 that annual rainfall was between 801 mm and 1200 mm in 15 years out of 32.

In the district especially in higher mountains, considerable amount of precipitation is received in the form of snow. Snowfall mainly occurred in the winter months; November to March.

On an average there are 74 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 58 at Malashahibag to 82 at Prang.

The heaviest rainfall recorded in 24 hours at any station in the district was 251.2 mm at Sonemarg observatory on 25th September 1954.

TEMPERATURE

There is no meteorological observatory in the district and hence the meteorological parameters recorded at Gulmarg observatory at an elevation about 2600 metres and Srinagar observatory at an elevation of approximately 1587 metres in the neighbouring Baramulla and Srinagar districts respectively may be taken for climatic conditions for this district. Temperature and other meteorological condition vary depending much on the topography of the place. The cold season is from November to mid-March. Temperatures begin to decrease from November. January is the coldest month with mean maximum temperature of about 6°C and mean minimum temperature of about -2°C. In association with cold waves, the minimum temperature may sometimes drop to below -18°C on individual days. The day and night temperatures both begin to rise from March and continue till July. July is the hottest month with mean maximum temperature of about 30°C and mean minimum temperature of about 18°C. There is no much variation in the day temperatures between summer and monsoon months, however nights in the monsoon months are warmer than summer months. On some days, during the period April to August the maximum temperature may sometimes reach 37°C. Both the temperatures are 10°C

to 15°C lower over the places situated at higher altitudes in surrounding mountains. Weather is pleasant in months of April to June and October.

HUMIDITY

The atmosphere over the district is generally humid throughout the year. It is slightly less humid during April to October especially in the afternoons when relative humidity is about 60% but in other months humidity is around 80%.

CLOUDINESS

The skies are moderately clouded to overcast on many days in the period from December to May. In the winter season, the skies are sometimes obscured in the morning due to lifted fog which clears with the advance of day. Cloudiness decreases slightly thereafter and skies are lightly clouded in the remaining months.

WINDS

Winds are generally light and they mostly blow from southeast direction in the mornings and from the northwest direction in the afternoons throughout the year. On other occasions especially calm conditions generally prevail. The district being hilly and mountainous local winds such as anabatic and katabatic winds determine the speed and direction of wind at places.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur except December throughout the year. Its frequency is more in the period latter part of pre-monsoon and southwest monsoon season i.e. from April to September and thereafter with the activity being least in the winter months. Hail is rather rare and confined in winter and summer months. Fog is common almost throughout the year with its occurrence being more during the winter months.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
GANDERBAL

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Gund (Obsy)	27	a	79.9	79.5	93.8	133.8	111.9	66.2	73.3	92.8	69.8	46.7	27.3	48.8	923.8	156	60	140.3	25 Jun 1974
		b	6.1	6.9	8.0	11.1	10.7	4.7	7.2	8.8	5.3	3.9	2.8	4.8	80.3	(1957)	(1970)		
Malashahibag	31	a	48.3	69.7	98.1	85.8	65.7	35.1	57.6	60.5	34.4	31.0	28.7	34.9	649.8	144	49	100.6	22 Jul 1945
		b	4.7	6.3	8.3	7.3	6.4	3.4	5.2	5.3	2.8	2.7	2.5	3.1	58.0	(1963)	(1951)		
Prang	23	a	125.0	126.0	123.2	103.9	80.4	38.3	80.9	73.9	53.2	40.6	32.2	69.9	947.5	186	52	52.2	25 Jan 1977
		b	9.2	9.9	11.0	10.0	7.7	3.5	7.7	6.8	4.0	3.5	3.2	5.8	82.3	(1982)	(1970)		
Sonemarg (Obsy)	18	a	155.0	167.2	189.4	167.9	157.7	120.3	100.1	55.1	116.5	159.4	31.1	70.0	1489.7	369	61	251.2	25 Sep 1954
		b	7.6	8.4	8.1	7.0	8.3	6.9	7.5	7.0	5.6	3.8	2.2	3.8	76.2	(1957)	(1954)		
Ganderbal (District)		a	102.1	110.6	126.1	122.9	103.9	65.0	78.0	70.6	68.5	69.4	29.8	55.9	1002.8	209	38		
		b	6.9	7.9	8.9	8.9	8.3	4.6	6.9	7.0	4.4	3.5	2.7	4.4	74.4	(1956)	(1960)		

a: Normal rainfall in mm.

b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

* Based on all available data.

** Years of occurrence given in brackets.

TABLE - 2
FREQUENCY OF ANNUAL R/F IN THE DISTRICT
(DATA 1951 - 1994)
GANDERBAL

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS
301 - 400	1	1201 - 1300	2
401 - 500	2	1301 - 1400	0
501 - 600	1	1401 - 1500	1
601 - 700	1	1501 - 1600	0
701 - 800	8	1601 - 1700	0
801 - 900	8	1701 - 1800	0
901 - 1000	2	1801 - 1900	0
1001 - 1100	4	1901 - 2000	0
1101 - 1200	1	2001 - 2100	1

(Data available for 32 years)

JAMMU DISTRICT

Jammu district falls in the foothills of the Himalayas. The Shivalik range rises gradually towards the northern part of the district while it merges with the Indo-Gangetic plains in the south. Jammu city is situated on the banks of the river Tawi at an elevation of about 367 metres above mean sea level.

Jammu district has a sub-tropical extreme climate while it is hot and dry in summer and cold in winter. Nights are generally cooler being in the foothills of the mountains. The day and night temperatures start to fall rapidly from November till mid-February. The temperatures start to rise from March to June. The period of December to February is of winter season while March to third week of June is the summer season, followed by southwest monsoon till September. October and November constitute the post monsoon season.

RAINFALL

Records of rainfall in the district are available for three raingauge stations for period ranging from 11 to 40 years. The details of rainfall at these stations and for the district as a whole are given in Table 1 and 2. The average annual rainfall in the district is 1204.8 mm. The annual rainfall in the district varies over a large range. The rainfall in the southwest monsoon season (June to September) is about 69% of annual normal rainfall, while the rainfall in pre-monsoon months (March to May) is about 13% of the annual, July being the month with the highest rainfall with an average of 353.2 mm. The winter months (December to February) also contribute about 13% of the annual rainfall. In the fifty-year period 1951 to 2000, the highest annual rainfall of 160% of the normal was recorded in year 1996, while the lowest was 45% of the normal recorded in 1951. During this period, there were 7 years in which the rainfall was less than 80% of the normal and there were one occasion of two consecutive years and one occasion of three consecutive years of such low rainfall. It is seen from Table 2 that the annual rainfall was between 901 mm and 1500 mm in 19 years out of 32.

On an average there are 50 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 32 at Sri Ranbirsingh to 61 at Akhnoor Observatory.

The heaviest rainfall recorded in 24 hours at any station in the district was 299.2 mm at Jammu on 31st July 1961.

TEMPERATURE

There is one meteorological observatory in the district at Jammu town at an elevation of approximately 367 metres. The elevation of the district varies from 300 metres to about 850 metres. The description of climate that follows is based on the records of meteorological parameters recorded at Jammu observatory which may be taken as representative of the district. Temperatures begin to decrease from the middle of November. January is the coldest month with mean maximum temperature of about 18.9°C and mean minimum temperature of about 7.8°C. In association with cold waves, the minimum temperature may sometimes drop to below 1°C on individual days. The day and night temperatures both begin to rise from March and attain maximum values in June. June is the hottest month with mean maximum temperature of about 38.7°C and mean minimum temperature is 26°C. On individual days during the period May to July the maximum temperature sometimes reaches 45°C. The temperatures may be 2°C or 3°C lower in hilly areas and 1° - 2°C high in low plain area with reference to Jammu city. Summer season is hot and sometimes becomes scorching. After onset of southwest monsoon by the end of June day temperatures go down marginally in the months of July and August. However, night temperatures are little more as in summer. October onward both temperatures begin to decrease; however, drop in night temperature is significant. Weather is pleasant in post monsoon season.

The highest maximum temperature ever recorded at Jammu observatory was 47.4°C on 31st May 1988 and the lowest minimum temperature ever recorded was 0.6°C on 11th January 1945.

HUMIDITY

The atmosphere over the district is generally humid during the period July to February especially in the mornings when the relative humidity is about 70% to 80%. In the afternoons during the same period it is between 55% and 70%. It is slightly less humid during April to June especially in the afternoons when the humidity is about 30% to 40%.

CLOUDINESS

The skies are heavily clouded to overcast in the monsoon months July and August. The period from September to November the skies are very lightly clouded. During winter season and early part of pre-monsoon season skies are light to moderately clouded, however, skies are heavily clouded to overcast on some days when western disturbances affect the district during this period.

WINDS

Winds are generally light to moderate in latter part of summer and early part of monsoon season. Winds mostly blow from northeast direction throughout the year in the mornings. Easterly component is also observed in the mornings on some days during the period July and August. While westerly or southwesterly winds are predominant during the period January to October in the afternoons. Sometimes northwesterly wind which is predominant in the afternoons during November and December, are also observed on some days during January to June.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year. Its frequency is more in the period March to September but subsequently reduces its activity after September, being least in the months of November to January. Thunderstorms in summer are occasionally accompanied with hails and squalls. Hail during the period March to May is the highest while it is occasionally noticed in other months. Dust storms occur

during the period February to November and its frequency is maximum during the period March to May. Fog is common during the winter months.

Table 3, 4, 5 and 6 give the temperature, humidity, cloudiness, mean wind speed and predominant wind directions and special weather phenomena respectively for Jammu observatory.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
JAMMU

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Akhnoor (Obsy)	11	a	56.3	86.8	102.6	73.9	78.3	53.0	414.6	296.3	79.3	53.6	32.6	39.3	1366.6	135	74	166.4	30 Jul 1989
		b	3.4	4.8	5.9	4.8	4.0	3.6	11.8	12.8	3.3	2.6	1.0	2.7	60.7	(1985)	(1987)		
Jammu (Obsy)	40	a	51.3	64.6	65.3	37.3	26.4	72.2	335.7	359.7	134.4	32.1	13.8	39.9	1232.7	156	52	299.2	31 Jul 1961
		b	3.3	3.7	4.4	2.7	2.5	4.3	11.3	12.9	5.3	1.7	1.1	2.2	55.4	(1996)	(1962)		
Sri Ranbir-singh	15	a	56.9	53.0	40.1	15.3	24.7	53.7	309.4	286.4	116.4	27.9	1.7	30.3	1015.8	130	53	207.0	05 Jul 1967
		b	2.2	2.6	2.2	0.5	1.2	2.2	8.1	8.1	2.8	0.9	0.1	1.3	32.2	(1955)	(1951)		
Jammu (District)		a	54.8	68.1	69.3	42.2	43.1	59.6	353.2	314.1	110.0	37.9	16.0	36.5	1204.8	160	45		
		b	3.0	3.7	4.2	2.7	2.6	3.4	10.4	11.3	3.8	1.7	0.7	2.1	49.6	(1996)	(1951)		

a : Normal rainfall in mm.

b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

* Based on all available data.

** Years of occurrence given in brackets.

TABLE - 2
FREQUENCY OF ANNUAL R/F IN THE DISTRICT
(DATA 1951 - 2000)
JAMMU

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS
501 - 600	1	1301 - 1400	2
601 - 700	1	1401 - 1500	1
701 - 800	2	1501 - 1600	1
801 - 900	3	1601 - 1700	1
901 - 1000	0	1701 - 1800	2
1001 - 1100	3	1801 - 1900	0
1101 - 1200	7	1901 - 2000	2
1201 - 1300	6		

(Data available for 32 years)

TABLE - 3
Normals of Temperature and Relative Humidity
(JAMMU)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity %	
	°C	°C	°C	Date	°C	Date	0830 IST	1730 IST
January	18.9	7.8	28.0	31.01.2001	0.6	11.01.1945	83	62
February	21.6	9.8	31.7	22.02.1947	1.1	01.02.1929	77	54
March	25.9	13.9	37.2	31.03.1945	4.4	05.03.1945	68	
April	32.0	18.9	43.9	29.04.1941	8.5	07.04.1994	55	39
May	37.2	23.3	47.4	31.05.1988	9.8	13.05.1982	46	32
June	38.7	26.0	47.2	12.06.1953	13.8	15.06.1982	52	37
July	34.0	25.3	45.0	01.07.1951	14.0	03.07.1978	78	64
August	33.1	24.8	41.7	07.08.1918	15.0	29.08.1982	84	72
September	33.1	23.1	38.9	12.09.1967	15.0	20.09.1950	79	65
October	31.2	18.1	37.9	06.10.1965	11.3	30.10.1982	69	57
November	26.6	13.0	34.2	03.11.1965	6.1	30.11.1962	74	63
December	21.2	9.0	28.1	01.12.1966	0.9	28.12.1998	80	68
Annual	29.5	17.7	47.4	31.05.1988	0.6	11.01.1945	70	56

TABLE – 4
Mean Cloud Amount ** (Okta of the Sky) and Mean Number
of days of Clear and Overcast Skies
(JAMMU)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	10	7	7	9	12	13	3	3	11	20	16	11	122
b	5	4	6	3	2	2	8	7	2	1	1	4	45
c	3.7	3.6	4	3.2	2.6	2.4	5	5	2.7	1.4	1.7	3.2	3.2
1730 HOURS IST													
a	7	4	2	2	3	4	1	1	4	12	11	8	59
b	4	4	5	3	2	1	4	3	1	1	1	4	33
c	3.6	4	4.5	3.9	3.4	2.8	4.4	4.4	2.6	1.4	2.1	3.3	3.4

- a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** Okta = Unit equal to area of one eighth of the sky used in specifying cloud amount.
For example: 1 Okta means 1/8th of the sky covered.

TABLE - 5
Mean Wind Speed and Predominant Wind Direction
(JAMMU)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind Speed in km/hr	4.4	4.9	5.4	5.7	6.1	5.1	4.3	3.6	4.1	4.6	4.6	4.2	4.7
Direction in morning	NE	NE	NE	NE	NE/C	NE	C/NE/E	C/NE/E	NE	NE	NE	NE	
Direction in evening	C/W/ SW	SW/W/ C/NW	SW/W/ C/NW	SW/W/ NW/C	SW/C/ W/NW	SW/W/ NW/C	C/SW/ W/S	C/SW/ W	C/SW/ NW/W	C/SW	C/NW	C/NW	

TABLE - 6
Special Weather Phenomena
(JAMMU)

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	1.2	2.6	4.8	5.9	6.8	9.3	11.8	11.4	7.3	2.6	1.3	1.1	66.1
Hail	0.3	0.3	0.4	0.4	0.5	0.3	0.1	0.1	0.1	0.1	0.1	0.1	2.7
Dust-storm	0.0	0.1	0.2	1.5	2.8	2.6	1.3	0.7	1.0	0.2	0.1	0.0	10.5
Fog	1.4	0.3	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	1.4	3.3
Squall	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.3

KARGIL DISTRICT

Kargil district is mountainous desert areas having an average elevation of ranging from 2500 metres to 7200 metres above mean sea level. Kargil town is the head quarters of the district situated at altitude about 2679 metres. The topography of the region is mountainous and valleys with little vegetation. The district is divided in to four high level natural valleys namely Suru Valley, Drass Valley, Indus Valley and Upper Sindh Valley of Kanji Nallah Valley. High peaks Namaikala and Penzila are called sky pillars of the district. In Zanskar ranges which separate the district from the Kashmir valley, permanent glacial body exists because of higher elevation of these ranges. Suru valley has comparatively lower altitude which constitutes the major part of the district and most of the villages are located in the valley. This valley is comparatively warmer and favourable for cultivation.

Kargil district lies in rain shadow side of the Himalaya, where dry monsoon winds reach after exhausting its moisture in plain and Himalayan mountain. The district has wide range of climate from sub-tropical to temperate and even alpine in high elevated regions. Summers are little warm with cool nights, while winters are long and severe cold with temperature often dropping below -40°C . The Zanskar plateau is even colder, thus making it a near inhabitable place for humans. This is the coldest inhabited area.

The main features of the climate are (i) wide yearly diurnal variation of temperature, low precipitation mainly in the form of snow, low relative humidity throughout the year except winter and strong wind. Winter starts from November when both the day and night temperatures fall rapidly and severe cold condition continues till March. The winter is followed by pre-monsoon season till June. Thereafter, southwest monsoon season starts and continues till September. October month is the transition period between the monsoon season and winter.

RAINFALL

Records of rainfall in the district are available for three rain gauge stations for period ranging from 12 to 16 years. The details of rainfall at these stations and for the district as a whole are given in Tables 1 and 2. The average annual rainfall in the district is 319.4 mm. The rainfall in southwest monsoon season (June to September) is about 24% of the annual normal rainfall, while the rainfall in pre-monsoon months (March to May) accounts for 33% of the annual, March being the month with the highest rainfall with an average of 44.2 mm. The winter months (December to February) contribute rainfall for about 31% of the annual normal rainfall. In the period 1955 to 1984, the highest annual rainfall of 202% of the normal was recorded in the year 1957, while the lowest was 18% of the normal recorded in 1965. During this period, there were three years in which the rainfall was less than 80% of the normal and none of them were consecutive.

Heavy snowfall is experienced in winter. During November to March low temperature as well as high relative humidity are favourable conditions for occurrence of heavy snowfall over the entire district. The average height of snowfall is about 200 to 500 cm.

On an average there are 27 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 22 at Mulbeck observatory to 35 at Pendas Observatory.

The heaviest rainfall recorded in 24 hours at any station in the district was 99.8 mm at Dras on 25th August 1957.

TEMPERATURE

There is no meteorological observatory in the district, hence the meteorological parameters recorded at Leh at an elevation of approximately 3514 metres in the neighbouring Leh district may be taken as representative for this

district. Temperature and other meteorological conditions depend to a large extent on the topography of the place. The cold season is from November to mid-April. Temperatures begin to decrease from the middle of October till mid-February. January is the coldest month with mean maximum temperature of about 2°C and mean minimum temperature of about -12°C at Kargil town (ht. 2673 m). In association with cold waves, the minimum temperature may sometimes drop to below -25°C on individual days. The day and night temperatures both begin to rise from the second half of February and reaches its highest in July or August, which are the hottest months with mean maximum temperature of about 28°C and mean minimum temperature of about 13°C. On some days, during the period April to August the maximum temperature reaches 34°C. The temperatures are 15°C to 20°C lower at high altitudinal areas with reference to Kargil town. The minimum temperature in this district was observed -48°C at Dras. The period of April to October is of pleasant with cool atmosphere.

HUMIDITY

The atmosphere over the district is generally dry throughout the year. It is less humid during June to October especially in the afternoons when relative humidity is about 25% to 40%. It is slightly humid i.e. 50% during November to May.

CLOUDINESS

The skies are moderately clouded to overcast on some days in the period from December to March. In the winter season, the skies sometimes are obscured in the morning due to lifted fog which clears with the advance of day. Cloudiness decreases slightly thereafter and skies are lightly clouded in the remaining year. The cloudiness is more in afternoons than in mornings.

WINDS

Winds are generally moderate with some increase in force in the period from April to June. In the morning wind blows from northeast or southwest direction during

January and February months and from south or southwest direction in the rest of the year. While in the afternoon southwesterly wind is predominant throughout the year with westerly wind blowing on some days during period; April to September. Northwesterly winds are also noticed on some days in the evening in month of June.

SPECIAL WEATHER PHENOMENA

Thunderstorms activity in the district is very low throughout the year. Its frequency is more in December, occasionally accompanied with hail and squall. Fog occurs during the winter months.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
KARGIL

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Dras (Obsy)	13	a	33.1	56.1	44.6	36.6	30.3	6.7	18.3	59.0	7.4	17.6	54.7	40.9	405.3	283	14	99.8	25 Aug 1957
		b	2.4	3.0	3.4	2.2	3.0	0.7	1.0	0.9	0.8	0.7	2.7	2.4	23.2	(1957)	(1963)		
Mulbeck (Obsy)	16	a	34.0	21.3	30.4	22.0	5.4	7.0	17.5	7.9	6.1	7.7	7.1	20.3	186.7	228	30	64.8	05 Jul 1959
		b	3.9	3.3	4.0	2.4	0.8	0.7	0.9	0.5	0.4	9.8	1.3	3.0	22.0	(1959)	(1965)		
Pendras (Obsy)	12	a	37.9	39.2	57.7	36.4	54.3	24.9	32.8	29.5	16.9	14.9	10.3	11.3	366.1	194	43	85.4	03 Mar 1979
		b	3.4	3.6	5.4	4.1	5.8	2.6	2.3	2.1	2.0	1.5	1.2	0.6	34.6	(1959)	(1967)		
Kargil District		a	35.0	38.9	44.2	31.7	30.0	12.9	22.9	32.1	10.1	13.4	24.0	24.2	319.4	202	18		
		b	3.2	3.3	4.3	2.9	3.2	1.3	1.4	1.2	1.1	1.0	1.7	2.0	26.6	(1957)	(1965)		

a: Normal rainfall in mm.

b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

* Based on all available data.

** Years of occurrence given in brackets.

TABLE - 2
FREQUENCY OF ANNUAL R/F IN THE DISTRICT
(DATA 1955 - 1984)
KARGIL

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS
001 - 100	2	401 - 500	0
101 - 200	1	501 - 600	0
201 - 300	0	601 - 700	2
301 - 400	0		

(Data available for 5 years)

KATHUA DISTRICT

Kathua district has three distinct areas. The area of low elevation up to 500 metres in southern part touches Pakistan and Punjab border. The second zone falling its north extending up to foothills of Himalayas and falling mostly in the Shivalik ranges is called Kandi area. The third area falls beyond Shivalik ranges and extends up to Pir-Panjaj ranges. This area is mountainous in nature and is called the hilly area. The peak height in the district is at about 2134 metres above mean sea level.

Kathua district experiences wide range of climate from sub-tropical to temperate. Due to altitudinal variations, there is a vast difference in the temperatures at the plains and hilly areas. The district experiences rainfall during winter and early summer primarily from western disturbances and monsoon rains from July onwards. The hilly areas receive more rains than the plains.

Both the day and night temperatures start to fall rapidly by the end of November till early March. The period of December to February is of winter season. The summer season from March to third week of June is followed by southwest monsoon season till September. October and November months constitute the post monsoon season.

RAINFALL

Records of rainfall in the district are available for two raingauge stations for period of 60 and 65 years. The details of rainfall at both stations and for the district as a whole are given in Tables 1 and 2. The average annual rainfall in the district is 1424.9 mm. The rainfall in southwest monsoon season (June to September) is about 74% of the annual normal rainfall, while the rainfall in pre monsoon months (March to May) accounts for 8% of the annual, August being the month with the highest rainfall with an average of 436 mm. The winter months (December to February) also contribute rainfall of 15% of the annual normal rainfall. In the period 1901 to 2000, the highest annual rainfall of 149% of the normal was recorded in year 1914, while

the lowest was 38% of the normal recorded in 1951. During this period, there were 12 years in which the rainfall was less than 80% of the normal and there were two occasions of two consecutive years of such low rainfall. It is seen from Table 2 that annual rainfall was between 1101 mm and 1800 mm in 41 years out of 61.

Precipitation in the form of snow is received at high altitudinal areas i.e. northern part of the district in winter. Most of higher areas in Basohli and Billwar experiences snowfall for most part of the year.

On an average there are 54 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 50 at Kathua to 58 at Basohli.

The heaviest rainfall recorded in 24 hours at any station in the district was 228.6 mm at Basohli on 4th October 1955.

TEMPERATURE

There is no meteorological observatory in the district hence the meteorological parametres recorded at Jammu at an elevation of 367 metres in the neighbouring Jammu district may be taken as representative for this district. Kathua town is the headquarters of the district at an elevation at about 380 metres. The elevation of the district varies from 300 metres to about 2134 metres and as temperature and other meteorological conditions depend much on the topography as it varies from place to place. The summer temperatures can be as high as 46⁰C in the plains while winter temperature in the upper hilly areas touches sub-zero and experiences snowfalls in northern part of the district. The cold season is from December to February. Temperatures begin to decrease from the end of November till February. January is the coldest month with mean maximum temperature of about 19⁰C and mean minimum temperature of about 8⁰C at Kathua town. In association with cold waves, the minimum temperature may sometimes drop to below 0⁰C on individual days. The day and night temperatures both begin to rise from March and attain maximum values in June. June is the hottest month with mean maximum

temperature of about 39°C and mean minimum temperature of about 26°C. Summers are hot while the temperatures only go down marginally in the months of July and August. The temperatures may be 5°C to 10°C high in hilly areas and 1° - 2°C high in plain areas with reference to Kathua. October onwards both temperatures begin to decrease, however drop in night is significant. Weather is pleasant in months of post monsoon season.

HUMIDITY

The atmosphere over the district is generally humid during the period July to February especially in the mornings when relative humidity is about 75%. In the afternoons during the same period it is between 55% and 65%. It is slightly less humid during April to June especially in the afternoons when the humidity is about 30% to 40% and in the morning it is about 50%.

CLOUDINESS

The skies are heavily clouded to overcast in the monsoon months particularly in July and August. During winter and early part of pre-monsoon season skies are light to moderately clouded, however skies are heavily clouded to overcast on some days when western disturbances affect the district during this period.

WINDS

Winds are generally light to moderate in latter part of summer and early part of monsoon season. Winds mostly blow from northeast direction in the mornings throughout the year. Easterly component is observed in the mornings on some days during the period July and August, while westerly wind or southwesterly winds are predominant during the period January to October in the afternoons. Sometimes northwesterly wind which is predominant in the afternoons during November and December, are also observed on some days during January to June.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year. Its frequency is more in the period April to September but subsequently reduces its activity in September being least in the winter months of November to January. Thunderstorms in summer are occasionally accompanied with hailstorms and squalls. Hail during the period March to May is the highest while it is occasionally noticed in other months. Dust storms occur in the district from February to November and its frequency is maximum in May and June. Fog is common during winter months.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
KATHUA

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Basohli	60	a	105.5	96.0	76.3	36.1	22.7	74.6	445.9	497.1	142.7	32.5	10.8	49.5	1589.7	160	44	228.6	04 Oct 1955
		b	4.4	4.6	3.8	2.4	1.7	3.9	13.4	14.9	4.7	1.3	0.6	2.4	58.1	(1942)	(1918)		
Kathua	65	a	73.0	61.4	52.5	29.8	16.9	55.2	358.6	375.0	164.9	29.3	5.9	37.7	1260.2	176	43	215.9	05 Oct 1955
		b	3.6	3.6	3.1	2.0	1.4	3.0	11.6	12.4	5.2	1.2	0.5	2.1	49.7	(1967)	(1951)		
Kathua (District)		a	89.3	78.7	64.4	32.9	19.8	64.9	402.2	436.0	153.8	30.9	8.4	43.6	1424.9	149	38		
		b	4.0	4.1	3.4	2.2	1.5	3.5	12.5	13.6	5.0	1.2	0.6	2.2	53.8	(1914)	(1951)		

a: Normal rainfall in mm.

b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

* Based on all available data.

** Years of occurrence given in brackets.

TABLE - 2
FREQUENCY OF ANNUAL R/F IN THE DISTRICT
DATA (1901 - 2000)
KATHUA

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS
501 - 600	1	1401 - 1500	7
601 - 700	1	1501 - 1600	9
701 - 800	5	1601 - 1700	2
801 - 900	0	1701 - 1800	3
901 - 1000	1	1801 - 1900	3
1001 - 1100	3	1901 - 2000	0
1101 - 1200	2	2001 - 2100	4
1201 - 1300	8	2101 - 2200	2
1301 - 1400	10		

(Data available for 61 years)

KISHTWAR DISTRICT

Kishtwar district has mountains and valleys surrounded by mighty Himalayas. Altitude in the district varies from 900 to 6575 metres above mean sea level. Kishtwar town is the headquarters of the district which is situated on the banks of river Chenab. The monsoon hardly reaches in the areas of high altitudes of this district. Hence there is less rainfall in those areas. Marwah-Wardwan area which remains cut off for some period due to snowfall in winter. Climate of the district is generally dry and cold. Winter starts from the middle of November when both the day and night temperatures fall rapidly, and lasts till mid-March. March to last week of June is the summer season followed by southwest monsoon season till September. Summer months are generally pleasant. The period of October to mid-November constitutes the post monsoon season.

RAINFALL

Records of rainfall in the district are available for one raingauge station- Kishtwar (ht 1640 m) for a period of 53 years. The details of rainfall at this station may be considered for the district as a whole are given in Tables 1 and 2. The average annual rainfall in the district is 887.8 mm. The rainfall varies from place to place in the district due to topographic variation. The rainfall in southwest monsoon season (June to September) is about 29% of the annual normal rainfall, while the rainfall in pre-monsoon months (March to May) accounts for 34% of the annual, March being the month with the highest rainfall with an average of 140.5 mm. The winter months (December to February) contribute rainfall about 31% of the annual normal rainfall. In the period 1901 to 1962, the highest annual rainfall of 149% of the normal was recorded in year 1914, while the lowest was 50% of the normal recorded in 1941. During this period, there were 7 years in which the rainfall was less than 80% of the normal and there were one occasion of two consecutive years and one occasion of three consecutive years of such low rainfall. It is seen from Table 2 that annual rainfall was between 701 mm and 1200 mm in 32 years out of 42.

Considerable amount of precipitation is received in the form of snowfall in winter months in the elevated areas in the northeastern part of the district. Some area of the district is mostly covered by snow.

On an average there are 58 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district.

The heaviest rainfall recorded in 24 hours at any station in the district was 132.1 mm at Kishtwar on 15th April 1901.

TEMPERATURE

There is no meteorological observatory in the district, hence the meteorological parameters recorded at Kukernag observatory at an elevation about 1920 metres in the neighbouring Anantnag district may be taken as representative for this district. Kishtwar town is the headquarters of the district situated at an elevation of about 1640 metres. Temperature and other meteorological conditions depend very much on the topography of the place. The cold season is from mid-November to early March. Temperatures begin to decrease from the middle of November till early February. January is the coldest month with mean maximum temperature of about 6°C and mean minimum temperature of about -3°C at Kishtwar town. In association with cold waves, the minimum temperature sometimes drop to below -10°C on individual days and in extreme hilly part of the district minimum temperature may drop down to about -30° to -40°C. The day and night temperatures both begin to rise from March and continue till July or August, while the day temperature reaches its highest in July and August which are the hottest months with a mean maximum temperature of about 28°C and mean minimum temperature is 17°C. On individual days during the period April to August the maximum temperature sometimes reaches up to 35°C in the low elevated areas. Both the temperatures are 15° to 25°C lower over the places situated at high altitude in the district. The period of April to June and October and November is of pleasant with cool atmosphere.

HUMIDITY

The atmosphere over the district is generally humid throughout the year. It is slightly less humid during April to June and September to November especially in the afternoons when relative humidity is about 50% to 60% but in other months humidity is around 70% to 90%.

CLOUDINESS

The skies are heavily clouded to overcast during winter months December to March, thereafter cloudiness decreases and skies are moderately clouded till June. In July and August skies are overcast on some days. The hill-tops are frequently enveloped with clouds. In the winter season sky sometimes becomes obscured in the mornings due to lifted fog which clears with the advance of the day.

WINDS

Winds are generally light throughout the year but sometimes it becomes moderate and strong. They mostly blow from the southeast direction throughout the year. Northwesterly and southwesterly components are also seen in the afternoons. Calm conditions are also experienced on many occasions. The district being hilly, local winds such as katabatic and anabatic winds affect the speed and direction of wind at places.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year. During western disturbances thunderstorms are mostly observed. Sometimes precipitation occurs in form of snow or hail. Its frequency is more in the period April to July and reduces post July with the activity being least in the winter months November to March. Fog is common during winter months.

**TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
KISHTWAR**

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Kishtwar	53	a	106.2	111.3	140.5	101.7	61.8	41.9	77.6	71.5	63.2	31.5	20.1	60.5	887.8	149	50	132.1	15 Apr 1901
		b	6.5	6.3	7.6	7.1	4.9	3.3	5.8	5.6	3.4	2.0	1.3	3.9	57.7	(1914)	(1941)		
Kishtwar (District)		a	106.2	111.3	140.5	101.7	61.8	41.9	77.6	71.5	63.2	31.5	20.1	60.5	887.8	149	50		
		b	6.5	6.3	7.6	7.1	4.9	3.3	5.8	5.6	3.4	2.0	1.3	3.9	57.7	(1914)	(1941)		

- a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data.
** Years of occurrence given in brackets.

TABLE - 2
FREQUENCY OF ANNUAL R/F IN THE DISTRICT
(DATA 1901 - 1962)
KISHTWAR

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS
401 - 500	1	901 - 1000	7
501 - 600	1	1001 - 1100	3
601 - 700	5	1101 - 1200	6
701 - 800	5	1201 - 1300	2
801 - 900	11	1301-1400	1

(Data available for 42 years)

KULGAM DISTRICT

Kulgam district is hilly and mountainous towards west with inter-mountain valleys in the northeast. Kulgam district lies in the southern sector of Kashmir valley and its district headquarter Kulgam is situated at the altitude of about 1746 metres above mean sea level. Kulgam town is situated on the bank of river Veshaw across the wide spread of which is the foothills of great Pir Panjal mountains.

Winter starts from the middle of November when both the day and night temperatures fall rapidly till January or mid-February. The temperatures start to rise from March and remain steady till July. Mid-November to February is the winter season. The period of March to third week of June is of summer season and is followed by southwest monsoon season till September. October and mid -November constitute transition period between monsoon season and winter.

RAINFALL

Records of rainfall in the district are available for two rain gauge stations for period 31 and 38 years. The details of rainfall at these stations and for the district as a whole are given in Tables 1 and 2. The average annual rainfall in the district is 1090.7 mm. The annual rainfall in the district varies over a large range. The variation in annual rainfall from year to year is large. The rainfall in southwest monsoon season (June to September) is about 27% of the annual normal rainfall, while the rainfall in pre-monsoon months (March to May) accounts for 38% of the annual, March being the month with the highest rainfall with an average of 168.9 mm. The winter months of December to February account for about 27% of the annual normal rainfall. In the fifty-year period 1951 to 2000, the highest annual rainfall of 174% of the normal was recorded in year 1996, while the lowest was 32% of the normal recorded in 1951. During this period, there were 10 years in which the rainfall was less than 80% of the normal and there were four occasions when such low rainfall occurred in two consecutive years. It is seen from Table 2 that the annual rainfall was between 801 mm and 1400 mm in 22 years out of 39.

Considerable amount of precipitation in the district is received in the form of snow. About 163 cm of annual snowfall occurred annually at Quazigund place in the district. About 70% of the annual snowfall is received in the winter months. January and February are the months with the heaviest snowfall.

On an average there are 67 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 61 at Kulgam to 73 at Qazigund Observatory.

The heaviest rainfall recorded in 24 hours at any station in the district was 228.3 mm at Kulgam on 8th April 1962.

TEMPERATURE

There is one meteorological observatory in the district at Quazigund at an elevation of approximately 1690 metres. Kulgam town is the headquarter of the district situated at an elevation at about 1746 metres. The peak height in the district is about 3900 m. Temperature and other meteorological conditions depend much on the topography of the place and climate also varies from place to place. The description of climate that follows is based on the records of meteorological parameters. The cold season is from the middle of November to mid-March. Temperatures begin to decrease from the middle of November to mid-February. January is the coldest month with mean maximum temperature of about 6.3°C and mean minimum temperature of about -3.1°C. In association with cold waves, the minimum temperature may sometimes drop to below -15°C at Kulgam on individual days. The day and night temperatures both begin to rise from March and continue till July and remain more or less equal in August. The day temperature reaches its highest in July which is the hottest month with mean maximum temperature of about 28°C and mean minimum temperature of 16.9°C. On individual days during the period May to August the maximum temperature may sometimes reach up to 33°C. Both the temperatures are 5°C to 10°C lower over the places situated at high altitudinal areas. The period of April to June and October to November is of pleasant with cool atmosphere.

The highest maximum temperature ever recorded at Quazigund observatory was 35.7°C on 26th June 1988 and the lowest minimum temperature ever recorded was –16.7°C on 3rd February 1964.

HUMIDITY

The atmosphere over the district is generally humid throughout the year especially in the mornings when relative humidity is about 70% to 90%. It is slightly less humid during the afternoons when relative humidity is about 50% to 70% throughout the year. The humidity is less in months of April to June.

CLOUDINESS

The skies are heavily clouded to overcast during winter months December to March, thereafter cloudiness decreases and skies are moderately clouded till June. In months of July and August again cloudiness increases and skies are overcast on some days. Generally mornings during winter season are much cloudy than afternoons. The hill tops are frequently enveloped with clouds. In the winter season sky sometimes becomes obscured in the mornings due to lifted fog which clears with the advance of the day.

WINDS

Winds are generally light or calm in the mornings and evenings throughout the year and they mostly blow from south/southwest/west direction throughout the year. Easterly winds are also observed on some days in the mornings during the months of May to July. The district being hilly local winds such as anabatic and katabatic winds determine the speed and direction of wind at places.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year. Its frequency is more in the period April to September and reduces post September with the activity being least in the winter months November to March. Hail is rather rare and confined to the period March to June. Thunderstorms occur sometimes associated with dust storms in March. Fog is common during the winter months.

Table 3, 4, 5 and 6 give the temperature and humidity, cloudiness, mean wind speed and predominant wind directions, special weather phenomena respectively for Quazigund observatory.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
KULGAM

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Kulgam	31	a	76.5	73.3	131.6	132.1	108.5	39.9	81.6	76.9	69.0	37.5	28.6	29.0	884.5	195	39	228.3	08 Apr 1962
		b	5.1	5.6	8.0	7.8	7.1	3.2	5.5	6.6	3.7	3.0	2.6	2.7	60.9	(1962)	(1951)		
Qazigund (Obsy)	38	a	137.7	179.5	206.1	138.8	115.3	73.4	102.1	91.0	64.5	49.1	49.2	89.7	1296.4	147	63	164.0	14 Jun 1977
		b	7.5	8.5	9.6	8.4	8.1	4.6	7.0	5.8	3.7	3.1	2.5	4.6	73.4	(1996)	(1999)		
Kulgam (District)		a	107.1	126.4	168.9	135.5	111.9	56.7	91.9	84.0	66.8	43.3	38.9	59.3	1090.7	174	32		
		b	6.3	7.1	8.8	8.1	7.6	3.9	6.3	6.2	3.7	3.0	2.5	3.7	67.2	(1996)	(1951)		

a: Normal rainfall in mm.

b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

* Based on all available data.

** Years of occurrence given in brackets.

TABLE - 2
FREQUENCY OF ANNUAL R/F IN THE DISTRICT
(DATA 1951 - 2000)
KULGAM

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS
301 - 400	1	1201 - 1300	1
401 - 500	2	1301 - 1400	4
501 - 600	0	1401 - 1500	5
601 - 700	3	1501 - 1600	2
701 - 800	1	1601 - 1700	0
801 - 900	4	1701 - 1800	2
901 - 1000	1	1801 - 1900	0
1001 - 1100	4	1901 - 2000	1
1101 - 1200	8		

(Data available for 39 years)

TABLE - 3
Normals of Temperature and Relative Humidity
(QUAZIGUND)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity %	
	°C	°C	°C	Date	°C	Date	0830 IST	1730 IST
January	6.3	-3.1	16.2	31.01.2001	-15.7	25.01.1964	91	72
February	8.6	-1.5	19.2	13.02.1993	-16.7	03.02.1964	88	67
March	13.8	2.7	26.5	18.03.2004	-7.5	03.03.1968	83	58
April	20.0	6.8	31.4	26.04.1970	-1.5	15.04.1975	73	51
May	23.4	9.9	33.6	31.05.1988	-0.2	01.05.2004	73	54
June	27.4	13.6	35.7	26.06.1988	7.0	02.06.1979	70	52
July	28.0	16.9	34.5	11.07.1988	9.4	05.07.2009	79	62
August	27.8	15.9	35.0	01.08.1990	8.4	25.08.1996	83	64
September	26.5	11.2	32.8	08.09.1988	4.0	30.09.1982	79	55
October	22.0	5.5	29.6	01.10.1983	-1.2	26.10.2009	74	50
November	16.0	1.3	24.3	03.11.2007	-8.2	24.11.1962	80	57
December	9.3	-1.6	18.9	01.12.2002	-14.4	13.12.1964	88	67
Annual	19.1	6.5	35.7	26.06.1988	-16.7	03.02.1964	80	59

TABLE – 4

**Mean Cloud Amount ** (Okta of the Sky) and Mean Number
Of days of Clear and Overcast Skies
(QUAZIGUND)**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	3	2	3	7	10	12	3	2	11	16	15	8	92
b	16	14	14	7	5	2	6	6	3	3	4	10	90
c	5.8	5.8	5.6	4.1	3.5	2.6	4.9	4.8	2.8	1.9	2.8	4.7	4.1
1730 HOURS IST													
a	4	2	1	2	1	2	0	0	2	7	11	6	38
b	11	9	10	7	6	3	3	3	2	2	3	9	68
c	5.1	5.1	5.5	5.1	5	3.8	4.5	4.6	3.6	2.8	3	4.4	4.4

- a: Days with clear sky.
 b: Days with sky overcast.
 c: Mean cloud amount in Okta.
 ** Okta = Unit equal to area of one eighth of the sky used in specifying cloud amount.
 For example: 1 Okta means 1/8th of the sky covered.

TABLE - 5

**Mean Wind Speed and Predominant Wind Direction
(QUAZIGUND)**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind Speed in km/hr	2.1	2.6	3.0	2.6	2.3	2.6	3.1	2.7	2.4	2.0	1.7	1.6	2.4
Direction in morning	C	C	C/S/ SWW	C/SW/ SW	C/E/W	C/E/W	C/E/W	C	C	C	C	C	
Direction in evening	C/S/ SWW	C/SW/ SW	C/SW/ SW	C/SW/ W	C/SW/ E/W	C/W/ SW/E	C/SW/ W	C/SW/ W	C/SW/ W	C/SW/ W	C/SW/ /S	C/SW/ S	

TABLE - 6

**Special Weather Phenomena
(QUAZIGUND)**

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.4	1.0	3.9	6.9	11.3	8.4	8.0	6.7	5.4	2.7	0.8	0.4	55.9
Hail	0.0	0.0	0.3	0.6	0.3	0.1	0.0	0.0	0.0	0.2	0.0	0.0	1.5
Dust-storm	0.0	0.0	0.2	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.4
Fog	2.6	0.6	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.8	4.5
Squall	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

KUPWARA DISTRICT

Kupwara is hilly district located in the Kashmir valley between Pir-panjal and Shamsbiri mountain ranges surrounded by snow clad mountains and dense forest. The altitude of the hill ranges varies from 2000 metres to 4250 metres above mean sea level. The climate varies place to place in the district due to topographic variation. The climate of district is temperate cum mediterranean type. In the high elevated areas the temperature remains low throughout the year. Winter is cold and chilly. Winter season starts from the middle of November and severe cold conditions continue till mid-March. During these months strong wind brings rain and snow from mediterranean depressions. The temperatures start to rise from March and remain steady till August. The pre-monsoon / summer season from mid-March to June is short and milder. Sometimes heavy rain occurs during winter and summer months. The summer season is followed by southwest monsoon season till September. When the monsoon is strong, rain is caused. The succeeding period lasting till the middle of November is of post monsoon season.

RAINFALL

Records of rainfall in the district are available for four rain gauge stations for period ranging from 22 to 30 years. The details of rainfall at these stations and for the district as a whole are given in Tables 1 and 2. The average annual rainfall in district is 1052.6 mm. The rainfall in southwest monsoon season (June to September) is about 21% of annual normal rainfall, while the rainfall in pre-monsoon months (March to May) contributes 43% of the annual. March is the rainiest month with the rainfall with an average of 198.8 mm. The winter months (December to February) account for about 26% of annual normal rainfall. In the fifty-year period 1951 to 2000, the highest annual rainfall of 141% of the normal was recorded in 1996, while the lowest was 56% of the normal recorded in 2000. During this period, there were 12 years in which the rainfall was less than 80% of the normal and there was one occasion each when such low rainfall occurred in two and four consecutive years. It is seen from Table 2 that annual rainfall was between 801 mm and 1300 mm in 26 years out of 40.

In the district especially in higher mountains, considerable amount of precipitation is received in the form of snow. About 91 cm of snowfall occurred annually in the district. Snowfall mainly occurred in the winter which is about 80% of annual snowfall occurred in December to March.

On an average there are 72 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 64 at Handwara to 81 at Sogam.

The heaviest rainfall recorded in 24 hours at any station in the district was 144.8 mm at Langet on 5th July 1959.

TEMPERATURE

There is one meteorological observatory in the district at Kupwara town at an elevation of approximately 1600 metres. Temperature and other meteorological conditions depend very much on the topography of the place. The climate that follows is based on the records of meteorological parameters recorded at this observatory. The cold season is from the middle of November to mid-March. Temperatures begin to decrease from mid-November and continue to January or mid-February. January is the coldest month with mean maximum temperature of about 6.4°C and mean minimum temperature of about -2.8°C. In association with cold waves, the minimum temperature may sometimes drop to below -15°C on individual days. The day and night temperatures both begin to rise from the middle of March and continue till August, while the day temperature reaches its highest in July and August, which are the hottest months with mean maximum temperature of about 30.1°C and mean minimum temperature is 16.5°C. Days and nights in monsoon months are warmer than summer months. On some days, during the period; June to August the maximum temperature may sometimes reach 35°C. In general the temperatures are 10-15°C lower at high elevated areas with reference to Kupwara. Weather is generally pleasant with cool atmosphere during pre-monsoon and post monsoon seasons.

The highest maximum temperature ever recorded at Kupwara observatory was 37.6°C on 10th July 1999 and the lowest minimum temperature ever recorded was –15.7°C on 3rd January 1987.

HUMIDITY

The atmosphere over the district is generally humid throughout the year. The values of relative humidity throughout the year except June are more than 80% in the mornings. It is slightly less humid during April to June, September and October especially in the afternoons when relative humidity is about 50% to 60%.

CLOUDINESS

The skies are heavily clouded to overcast during the period December to March. Thereafter cloudiness slightly decreases and skies are moderately clouded to overcast from April to August. The skies are less cloudy in the month of October. In general skies are much cloudy in the evenings than mornings. The skies are sometime obscured in the morning due to lifted fog which clears with the advance of day.

WINDS

Winds are generally light or calm throughout the year. Westerly and north-westerly winds are predominant throughout the year in the afternoons. Northerly wind is predominant in the mornings during winter and post monsoon months. On other occasions especially during the period post April calm conditions generally prevail in the mornings. In hilly terrain anabatic and katabatic winds play a dominant role in air motion.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year. Its frequency is more in latter part of summer and southwest monsoon season. Thereafter its frequency decreases and thunderstorm activity being least in December and January. Thunderstorms occasionally accompanied with hails and confined to the period March to June. Fog is common during the winter months.

Table 3, 4, 5 and 6 give the temperature and humidity, cloudiness, mean wind speed and predominant wind directions, special weather phenomena respectively for Kupwara observatory.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
KUPWARA

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Handwara	27	a	79.8	106.0	189.3	166.8	99.5	36.7	68.9	49.5	28.0	58.5	47.8	49.1	979.9	176	62	140.5	04 Jul 1959
		b	6.4	7.4	9.9	9.2	6.7	3.3	5.2	3.9	2.3	3.1	2.9	3.9	64.2	(1972)	(1970)		
Kupwara Obsy	22	a	87.1	126.8	240.7	156.5	102.7	59.1	87.4	74.9	31.7	49.6	52.0	67.9	1136.4	131	52	108.1	17 Mar 1978
		b	7.8	8.9	12.4	9.7	8.6	4.7	6.3	5.4	2.6	3.7	3.5	4.5	78.1	(1996)	(2000)		
Langet	30	a	70.8	126.3	185.6	143.6	92.6	43.0	67.5	50.1	34.7	45.4	43.6	52.2	955.4	155	57	144.8	05 Jul 1959
		b	5.8	8.0	10.3	9.3	7.1	3.6	4.7	4.3	2.7	2.9	2.5	4.4	65.6	(1980)	(1974)		
Sogam	22	a	99.4	150.1	179.8	169.8	102.8	53.2	83.8	90.2	41.5	64.4	38.7	64.7	1138.4	135	59	70.4	23 Oct 1970
		b	7.8	10.2	10.8	11.3	7.6	4.2	6.5	6.3	3.7	4.2	2.8	5.3	80.7	(1972)	(1971)		
District Mean		a	84.3	127.3	198.8	159.2	99.4	48.0	76.9	66.2	34.0	54.5	45.5	58.5	1052.6	141	56		
		b	7.0	8.6	10.8	9.9	7.5	4.0	5.7	5.0	2.8	3.5	2.9	4.5	72.2	(1996)	(2000)		

a: Normal rainfall in mm.

b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

* Based on all available data.

** Years of occurrence given in brackets.

TABLE - 2
FREQUENCY OF ANNUAL R/F IN THE DISTRICT
(DATA 1951 - 2000)
KUPWARA

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS
501 - 600	1	1001 - 1100	5
601 - 700	4	1101 - 1200	9
701 - 800	4	1201 - 1300	7
801 - 900	5	1301 - 1400	2
901 - 1000	0	1401 - 1500	3

(Data available for 40 years)

TABLE - 3
Normals of Temperature and Relative Humidity
(KUPWARA)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity %	
	°C	°C	°C	Date	°C	Date	0830 IST	1730 IST
January	6.4	-2.8	16.2	31.01.2001	-15.7	03.01.1987	89	75
February	8.6	-1.2	19.7	27.02.1985	-12.0	01.02.2008	89	72
March	13.2	2.1	27.3	20.03.2010	-7.0	09.03.1979	86	66
April	20.6	6.5	31.7	29.04.2007	0.1	05.04.1989	81	59
May	24.6	9.7	34.8	14.05.2001	0.6	01.05.2004	80	58
June	28.6	13.1	36.9	26.06.2005	6.5	01.06.1982	78	52
July	30.1	16.9	37.6	10.07.1999	9.0	05.07.2009	82	64
August	30.2	16.2	36.6	21.08.1997	8.6	19.08.1980	86	63
September	28.7	10.9	35.8	11.09.2004	4.0	25.09.1982	84	54
October	23.2	5.1	33.6	05.10.2008	-1.5	26.10.2009	81	54
November	16.0	0.9	25.7	04.11.2000	-5.5	29.11.2007	86	64
December	9.1	-1.8	18.4	01.12.2009	-9.4	31.12.1986	89	71
Annual	19.9	6.3	37.6	10.07.1999	-15.7	03.01.1987	84	63

TABLE – 4
Mean Cloud Amount ** (Okta of the Sky) and Mean Number
Of days of Clear and Overcast Skies
(KUPWARA)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	5	5	4	10	12	13	8	8	13	17	13	9	117
b	17	13	15	8	6	3	5	5	4	4	6	12	98
c	5.4	5.4	5.3	3.8	3	2.3	3.5	3.5	2.5	2.1	3.1	4.5	3.7
1730 HOURS IST													
a	6	4	2	3	3	4	3	2	4	8	9	7	55
b	12	12	14	8	8	4	5	4	3	4	6	11	91
c	4.9	5.2	5.6	4.7	4.7	3.9	4.2	4.1	3.5	3.1	3.5	4.4	4.3

- a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** Okta = Unit equal to area of one eighth of the sky used in specifying cloud amount.
For example: 1 Okta means 1/8th of the sky covered.

TABLE - 5
Mean Wind Speed and Predominant Wind Direction
(KUPWARA)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind Speed in km/hr	0.5	0.6	0.7	0.9	0.7	0.6	0.5	0.3	0.4	0.5	0.6	0.5	0.6
Direction in morning	C/N	C/N	C/N	C	C	C	C	C	C/N	C/N	C/N	C/N	
Direction in evening	C/W/N/ SW/NW	C/NW/ W/N/SW	C/W/ NW	C/W/ NW	C/W/ N	C/W/ SW/NW	C/W/ NW	C/W/ SW	C/W/ SW/NW	C/W /NW/SW	C/W /SW/NW	C/W/ SW	

TABLE - 6
Special Weather Phenomena
(KUPWARA)

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.0	0.1	0.9	2.8	4.4	4.7	3.1	2.7	2.1	1.2	0.3	0.1	22.4
Hail	0.0	0.0	0.3	0.1	0.2	0.3	0.0	0.0	0.1	0.1	0.0	0.1	1.2
Dust-storm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.1	0.3
Fog	0.3	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.8	1.5
Squall	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

LEH DISTRICT

Leh district has an elevation of ranging from 2300 metres to 7650 metres above mean sea level. It is the second largest district in the country, having areas about 45100 sq km. Topographically, the whole district is mountainous with three parallel ranges of the Himalayas, Zaskar, Ladakh and Karakoram. The high hill-peaks in the district are generally covered by snow. Shayok, Indus and Zaskar rivers flow between these ranges and most of the population lives in valleys of these rivers. Leh lies in rain shadow side of the Himalaya, where dry monsoon winds reaches after exhausting its moisture in plains and Himalayas mountain. The district has climatic condition of both type arctic and desert; therefore Leh is often called 'Cold Desert'. The district has main climatic features which are wide yearly diurnal variation of temperatures, low precipitation and dry air. Leh has a cold desert climate with long harsh and extreme winters from November to end of March with minimum temperatures going below 0⁰C most of the time with occasional snowfall. The weather in the remaining months is generally dry and warm during the day. The winter is followed by pre-monsoon (summer) season till June. July to September is southwest monsoon season. October is a month of transition period between the monsoon season and winter.

RAINFALL

Records of rainfall in the district are available for four raingauge stations for period ranging from 16 to 25 years. The details of rainfall at these stations and for the district as a whole are given in Tables 1 and 2. The average annual rainfall in the district is 96.7 mm. The rainfall in southwest monsoon season (June to September) is about 45% of annual normal rainfall, while the rainfall in pre-monsoon months (March to May) accounts for 27% of the annual, July being the month with the highest rainfall with an average of 15.6 mm. The winter months (December to February) contribute rainfall about 21% of the annual normal rainfall. In the period 1951 to 2000, the highest annual rainfall of 179% of the normal was recorded in year 1961, while the lowest was 54% of the normal recorded in 1998. During this period, there were ten years in which the rainfall was less than 80% of the normal and on two occasions they were consecutive for two years and on one occasion for three

consecutive years when it was of such low rainfall. It is seen from Table 2 that annual rainfall was less than 100 mm in 15 years out of 23 for which whole year rainfall data is available.

In the district considerable amount of precipitation is received in the form of snow. The snow falling is quite heavy in the district and average snowfall occurs about 2000 – 4000 mm.

On an average there are 11 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 5 at Khalatse observatory to 14 at Panamik and Khangral observatory.

The heaviest rainfall recorded in 24 hours at any station in the district was 76.7 mm at Khalatse observatory on 10th July 1956.

TEMPERATURE

There is one meteorological observatory in the district at Leh at an elevation of approximately 3514 metres. Temperature and other meteorological conditions in the district depend very much on the topography of the place as district has peak height about 7650 m. The description of climate that follows is based on the records of meteorological parameters recorded at this observatory. Temperatures begin to decrease from second half of October. January is the coldest month with mean maximum temperature of about -2.0°C and mean minimum temperature of about -14.4°C . In association with cold waves, the minimum temperature at Leh may sometimes drop to below -28°C on individual days. The day and night temperatures both begin to rise from March and reach its highest in July /August, which are the hottest months with average maximum temperature of about 25°C and mean minimum temperature of about 10.3°C . On some days during the period June to August the maximum temperature may sometimes reach up to 32°C . There is large variation in temperatures during winter and summer season. The temperatures are 15°C - 20°C lower at high elevated areas with reference to Leh. The period of April to October is of pleasant with cool atmosphere.

The highest maximum temperature ever recorded at Leh observatory was 34.8°C on 29th June 1978 and the lowest minimum temperature ever recorded was –28.3°C on 11th January 1899.

HUMIDITY

The atmosphere over the district is generally dry throughout the year. The period from April to November is the driest part of year, when relative humidity is about 25% to 40%. Winter months January and February are slightly high humid, when humidity is around 50%.

CLOUDINESS

The skies are moderately clouded to overcast on some days in the period from December to April. In the winter season, the skies are sometimes obscured in the morning due to lifted fog which clears with the advance of day. Cloudiness decreases slightly thereafter and skies are lightly clouded in the remaining year. The cloudiness is more in the afternoon than morning.

WINDS

Winds are generally light to moderate with some increase in force in the period from March to June and sometimes it becomes strong. Dry cold winds generally prevail in winter. In the morning wind blows from northeast or southwest direction during January and February and mostly from south or southwest direction in the rest of the year. While in the afternoon southwesterly wind is predominant throughout the year and westerly wind blowing on some days during period from April to September. Northwesterly winds are also noticed on some days in the evening of June month.

SPECIAL WEATHER PHENOMENA

Thunderstorms activity in the district is very low, they do occur during the period from April to September and winter months December and January. Its frequency is more in month of December. Thunderstorms in month of April, May and December occasionally accompanied with hail and squall. When the air is dry occasional thunderstorms in the month of April, May and August lead to the dust-storms. Fog occasionally occurs during the winter months.

Table 3, 4, 5 and 6 give the temperature and humidity, cloudiness, mean wind speed and predominant wind directions, special weather phenomena respectively for Leh observatory.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
LEH

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Khalatse (Obsy)	20	a	2.7	5.7	6.9	6.4	2.7	1.0	11.0	8.0	3.0	2.2	1.3	3.6	54.5	299	17	76.7	10 Jul 1956
		b	0.1	0.7	0.6	0.6	0.3	0.1	0.6	0.9	0.1	0.3	0.1	0.6	5.0	(1956)	(1958)		
Khangral (Obsy)	20	a	7.9	11.3	17.4	8.9	10.7	6.7	18.5	6.3	21.3	4.4	1.6	3.9	118.9	200	27	50.6	11 Jul 1960
		b	1.2	1.5	2.4	1.1	1.2	0.7	1.8	0.8	1.9	0.6	0.2	0.7	14.1	(1957)	(1967)		
Leh (Obsy)	25	a	8.3	7.6	9.2	8.1	7.5	4.1	13.7	14.3	7.5	7.0	4.1	4.1	95.5	230	51	39.1	05 Oct 1955
		b	1.2	1.1	1.1	0.9	1.0	0.5	1.8	1.7	1.0	0.4	0.5	0.6	11.8	(1955)	(1965)		
Panamik	16	a	9.5	6.1	6.1	8.8	10.8	9.3	19.3	21.2	8.8	2.8	4.3	10.6	117.6	358	42	21.0	20 Dec 1960
		b	1.4	0.8	0.6	0.9	1.1	1.4	2.2	2.9	1.1	0.2	0.5	1.1	14.2	(1961)	(1958)		
Leh (District)		a	7.1	7.7	9.9	8.1	7.9	5.3	15.6	12.5	10.1	4.1	2.8	5.6	96.7	179	54		
		b	1.0	1.0	1.2	0.9	0.9	0.7	1.6	1.6	1.0	0.4	0.3	0.8	11.4	(1961)	(1998)		

a: Normal rainfall in mm.

b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

* Based on all available data.

** Years of occurrence given in brackets.

TABLE - 2
FREQUENCY OF ANNUAL R/F IN THE DISTRICT
(DATA 1951 – 2000)
LEH

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS
1 - 100	15	101 - 200	8

(Data available for 23 years)

TABLE – 3
Normals of Temperature and Relative Humidity
(LEH)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity %	
	°C	°C	°C	Date	°C	Date	0830 IST	1730 IST
January	-2.0	-14.4	8.3	29.01.1996	-28.3	11-01-1899	50	51
February	1.5	-11.0	12.8	28.02.1953	-26.4	01.02.1964	51	51
March	6.5	-5.9	19.4	29.03.2008	-19.4	08.03.2003	49	46
April	12.3	-1.1	23.9	29.04.1941	-12.8	02.04.2003	42	36
May	16.2	3.2	28.9	23-05-1893	-4.4	16.05.1886	39	30
June	21.8	7.4	34.8	29.06.1978	-1.1	04.06.1886	33	26
July	25.0	10.5	34.0	06.07.1978	0.6	08.07.1929	40	33
August	25.3	10.0	34.2	09.08.1978	1.5	26.08.1968	40	34
September	21.7	5.8	30.6	04.09.1883	-4.4	30.09.1940	37	31
October	14.6	-1.0	25.6	02.10.1916	-8.5	29.10.1968	38	27
November	7.9	-6.7	20.0	01.11.1929	-17.5	29.11.1978	42	40
December	2.3	-11.8	12.8	03.12.1891	-25.6	25.12.1937	46	46
Annual	12.8	-1.3	34.8	29.06.1978	-28.3	11-01-1899	42	38

TABLE – 4
Mean Cloud Amount ** (Okta of the Sky) and Mean Number
Of days of Clear and Overcast Skies
(LEH)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	8	6	5	6	7	6	7	5	9	17	10	10	96
b	8	5	6	4	3	2	4	3	2	1	3	5	6
c	4.6	4.5	4.2	3.5	3.4	2.6	3.5	3.7	2.6	1.7	2.6	3.8	3.4
1730 HOURS IST													
a	4	4	1	2	3	3	4	3	4	9	9	7	53
b	8	7	8	5	4	2	3	3	3	1	3	5	2
c	4.4	4.9	5	4.7	4.7	3.3	3.6	3.9	3	2.6	3	3.8	3.9

- a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** Okta = Unit equal to area of one eighth of the sky used in specifying cloud amount.
For example: 1 Okta means 1/8th of the sky covered.

TABLE - 5
Mean Wind Speed and Predominant Wind Direction
(LEH)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind Speed in km/hr	4.0	4.7	6.1	7.2	7.4	7.0	5.8	5.6	5.5	5.5	5.6	4.6	5.8
Direction in morning	C/NE/SW/S	C/NE/SW	C/S/SW	C/SW/S	C/S/SW	C/SW/S	C/SW	C/SW/W	C/S/SW	C/S/SW	C/S/SW	C/S/SW	
Direction in evening	C/SW	SW	SW	SW/W	SW/W	W/SW/NW	SW/W	SW/W	SW/W	SW	SW	C/SW	

TABLE - 6
Special Weather Phenomena
(LEH)

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.1	0.0	0.0	0.1	0.5	0.2	1.2	0.9	0.1	0.0	0.0	1.9	5.0
Hail	0.0	0.0	0.0	0.7	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.6	1.8
Dust-storm	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.5
Fog	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2	0.0	0.4
Squall	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2

POONCH DISTRICT

Topography of Poonch district is mountainous, low lying valleys, sky touching peaks covered with snow and lush green surrounding with altitudes ranges from 1007 metres near Poonch town to about 4700 metres above mean sea level on high hill ranges towards north eastern part of the district. Poonch is separated from Kashmir valley by the gigantic Pir-Panjal range, whose highest peak Tatakuti standing at 4743 metres. The climate of Poonch district varies with place to place due to topographic changes. Summers are generally short and pleasant but sometimes it becomes unpleasant in low elevated areas. Winters are cool and chilly characterized with rainfall due to western disturbances. The hilly areas receive snowfall in winter months. Winter season starts from the middle of November and continues till the middle of March. The period of March to June is of pre-monsoon season and followed by southwest monsoon season till September. The period of October to mid-November is of a transition period (post monsoon season) between monsoon season and winter.

RAINFALL

Records of rainfall in the district are available for only one raingauge station for a period of 12 years. The details of rainfall at this station which may be taken as representative for the district as a whole are given in Tables 1 and 2. The average annual rainfall in the district is 1458.1 mm. The annual rainfall in the district does not vary a lot. The rainfall in southwest monsoon season (June to September) is about 51% of the annual normal rainfall. July is the rainiest month with the highest rainfall with an average of 344.1 mm, while the rainfall in pre-monsoon season (March to May) accounts for 22% of the annual. The winter months (December to February) contribute rainfall about 22% of the annual normal rainfall. In the fifty-year period 1951 to 2000, the highest annual rainfall of 118% of the normal was recorded in year 1961, while the lowest was 75% of the normal recorded in 1999. During this period, there was only one year in which the rainfall was less than 80% of the normal. It is seen from Table 2 that the annual rainfall was between 1101 mm and 1600 mm in 5

years out of 7. Considerable amount of precipitation is received in the form of snowfall in the high altitudinal areas during winter season.

On an average there are 83 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district.

The heaviest rainfall recorded in 24 hours at any station in the district was 132 mm at Poonch on 9th September 1992.

TEMPERATURE

There is no meteorological observatory in the district hence the meteorological parameters recorded at Quazigund at an elevation of approximately 1690 metres in the neighbouring Kulgam district may be taken as representative for this district. The elevation of the district varies from 600 metres to about 4700 metres as temperature and other meteorological conditions depend on the topography which varies from place to place. The cold season is from the middle of November to about mid-March. Temperatures begin to decrease from November to mid-February and January is the coldest month with mean maximum temperature about 10°C and mean minimum temperature about 0°C at Poonch town (ht. 1060m). In association with cold waves, the minimum temperature may sometimes drop to below -10°C on individual days. The day and night temperatures both begin to rise from the middle of March and continue till July and remain more or less same in August. July is the hottest month with mean maximum temperature of about 32°C and mean minimum temperature is about 20°C. On individual days during the months of May to July the maximum temperature sometimes reaches 37°C. Both the temperatures are 10°C to 15°C lower over the places situated at higher altitudes in surrounding mountains with reference to Poonch town.

HUMIDITY

The atmosphere over the district is generally humid during the monsoon season and winter especially in the mornings when relative humidity is about 80%. The afternoons are generally less humid when it is between 55% to 70% except for the monsoon season and winter. The humidity during April to June is the lowest especially in the afternoons.

CLOUDINESS

The skies are heavily clouded to overcast during December to March, thereafter cloudiness decreases and skies are moderately clouded till June. In months of July and August again cloudiness increases and skies are overcast on some days. Generally mornings during winter season are much cloudy than afternoons. The hill-tops are frequently enveloped with clouds. In the winter season sky sometimes becomes obscured in the mornings due to lifted fog which clears with the advance of the day.

WINDS

Winds are generally light throughout the year. Winds mostly blow from the east direction throughout the year in the mornings while there is a moderate southwesterly component in the afternoons. A westerly component is also noticed during the period June to February in the afternoons. The district being hilly, local winds such as anabatic and katabatic winds determine the speed and direction of wind at places.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year. Its frequency is more in the period March to September but subsequently reduces its activity after September being least in the months of November to March. Hail during the period March to May is

the highest while it is occasionally noticed in other months. Fog is common during the post monsoon season and winter.

**TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
POONCH**

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Poonch	12	a	139.0	124.2	158.4	97.5	69.6	101.9	344.1	191.6	108.2	27.3	40.6	55.7	1458.1	118	75	132.0	09 Sep 1992
		b	8.4	7.4	8.7	6.9	5.6	5.7	15.0	11.1	5.9	2.6	2.2	3.3	82.8	(1961)	(1999)		
Poonch (District)		a	139.0	124.2	158.4	97.5	69.6	101.9	344.1	191.6	108.2	27.3	40.6	55.7	1458.1	118	75		
		b	8.4	7.4	8.7	6.9	5.6	5.7	15.0	11.1	5.9	2.6	2.2	3.3	82.8	(1961)	(1999)		

- a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data.
** Years of occurrence given in brackets.

TABLE - 2
FREQUENCY OF ANNUAL R/F IN THE DISTRICT
(DATA 1951 - 2000)
POONCH

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS
1001 - 1100	1	1401 - 1500	0
1101 - 1200	0	1501 - 1600	2
1201 - 1300	3	1601- 1700	0
1301 - 1400	0	1701 - 1800	1

(Data available for 7 years)

PULWAMA DISTRICT

Pulwama district is hilly and mountainous towards the northeast. The district with its headquarters at Pulwama lies in the southern part of Kashmir valley. The peak height in the district is about 3700 metres above mean sea level. The Valley area in the central part of the district has flat to mildly undulating topography with its elevation about 1600 m. The district is surrounded by hilly terrains. The river Jhelum passes through this district. The high altitudinal areas in the district receive snowfall in winter season.

Winter season starts from the middle of November and severe winter conditions continue till mid-March. The temperatures start to rise from March till June. The pre-monsoon (summer) season is from mid-March to the end of June and is followed by southwest monsoon season till September. When monsoon is strong, rain is caused. The succeeding period lasting till mid-November is of post monsoon season.

RAINFALL

Records of rainfall in the district are available for two raingauge stations for period of 11 and 29 years. The details of rainfall at these stations and for the district as a whole are given in Tables 1 and 2. The average annual rainfall in the district is 506.1 mm. The variation in annual rainfall from year to year is large. The rainfall in southwest monsoon season (June to September) is about 30% of the annual normal rainfall, while the rainfall in pre-monsoon months (March to May) accounts for 41% of the annual, March being the month with the highest rainfall with an average of 77.2 mm. The winter months (December to February) contribute rainfall about 22% of the annual normal rainfall. In the period 1952 to 1982, the highest annual rainfall of 160% of the normal was recorded in year 1954, while the lowest was 47% of the normal recorded in 1981. During this period, there were 9 years in which the rainfall was less than 80% of the normal and there was one occasion each when such a low rainfall occurred in two consecutive years and in four consecutive years. It is seen from Table 2 that the annual rainfall was between 401 mm and 600 mm in 9 years out of 25.

In the district especially in higher reaches considerable amount of precipitation is received in the form of snow during winter.

On an average there are 45 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number is 42 at Babapura and 48 at Tral.

The heaviest rainfall recorded in 24 hours at any station in the district was 228.6 mm at Babapura on 27th February 1958.

TEMPERATURE

There is no meteorological observatory in the district hence the meteorological parameters recorded at Srinagar at an elevation of approximately 1587 metres in the neighbouring district may be taken as representative for this district. Temperature and other meteorological conditions vary depending on the topography of the place. The cold season is from the middle of November to mid-March. Temperatures begin to decrease from the middle of November and severe winter condition continues till February. January is the coldest month with mean maximum temperature of about 6°C and mean minimum temperature of about -2°C in valley region. In association with cold waves, the minimum temperature may sometimes drop to below -15°C on individual days. The day and night temperatures both begin to rise from middle of February and continue till July and remain more or less equal in August. The day temperature reaches its highest in July, which is the hottest month with mean maximum temperature of about 30°C and mean minimum temperature is 18°C. On individual days during the period April to August the maximum temperature sometimes reaches up to 36°C. Both the temperatures are 5°C to 10°C lower over the places situated at higher altitudes in surrounding mountains. The months of summer and post monsoon season are mostly pleasant with cool atmosphere.

HUMIDITY

The atmosphere over the district is generally humid throughout the year. It is slightly less humid during April to October especially in the afternoons when relative humidity is about 50% to 55% but in other months humidity is around 80%.

CLOUDINESS

The skies are moderately clouded to overcast on many days in the period from December to March. In the winter season, the skies sometime are obscured in the morning due to lifted fog which clears with the advance of day. Cloudiness decreases slightly thereafter and skies are lightly clouded in the remaining period of year except in the monsoon months July and August when skies are heavily clouded to overcast on some days.

WINDS

Winds are generally light and they mostly blow from the southeast direction in the mornings and from the northwest direction in the afternoons throughout the year. On other occasions especially calm conditions generally prevail. The district being hilly and mountainous, local winds such as katabatic and anabatic winds determine speed and direction of wind at places

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year. Its frequency is more in the period of latter part of pre-monsoon and southwest monsoon season i.e. from April to September and thereafter the activity being least in the winter months. Hail is rather rare and confined to winter and summer months. Fog is common almost throughout the year with its occurrence being more during the winter months.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
PULWAMA

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Babapura	29	a	47.9	60.3	70.3	64.4	57.9	22.2	45.5	51.4	32.8	27.5	13.5	19.0	512.7	167	46	228.6	27 Feb 1958
		b	4.0	3.8	6.1	6.0	4.6	2.1	3.7	3.9	2.1	2.1	1.6	2.2	42.2	(1966)	(1981)		
Tral	11	a	36.5	37.2	84.1	80.7	58.0	28.8	39.6	43.7	42.2	14.5	11.8	22.5	499.6	143	35	80.0	23 Mar 1963
		b	4.2	4.8	6.4	7.4	5.1	2.5	3.9	5.1	2.4	1.8	1.7	2.5	47.8	(1966)	(1970)		
Pulwama (District)		a	42.2	48.7	77.2	72.6	58.0	25.5	42.5	47.6	37.5	21.0	12.6	20.7	506.1	160	47		
		b	4.1	4.3	6.3	6.7	4.9	2.3	3.8	4.5	2.2	1.9	1.7	2.3	45.0	(1954)	(1981)		

a: Normal rainfall in mm.

b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

* Based on all available data.

** Years of occurrence given in brackets.

TABLE - 2
FREQUENCY OF ANNUAL R/F IN THE DISTRICT
(DATA 1952 - 1982)
PULWAMA

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS
201 - 300	3	601 - 700	4
301 - 400	6	701 - 800	2
401 - 500	3	801 - 900	1
501 - 600	6		

(Data available for 25 years)

RAJOURI DISTRICT

Rajouri district is located in the foothills of Pir Panjal range. Physiographically the district is characterized by mountain ranges trending northwestward direction and deep narrow valleys. Pir Panjal range in the northeastern side of the district separates it from the Kashmir valley where high peaks are found. The altitude in the district generally varies from 500 to 4535 metres above mean sea level towards the north. The climate varies from sub-tropical in the southern part to temperate in the mountainous northern part. The sub-tropical region receives rainfall during the monsoon season and winter whereas the northern part prone to hailstorms experiences more rains. Summers are short and pleasant, however sometimes they may be harsh particularly in southern part of the district. Winters are cool and chilly, and are sometimes associated with rain and fog due to western disturbances.

Winter starts by the middle of November and continues till early March. The period from March to 3rd week of June is of pre-monsoon season followed by southwest monsoon season till September. The period of October to mid-November constitutes post monsoon season and it is a transition period between southwest monsoon season and winter.

RAINFALL

Records of rainfall in the district are available for one raingauge station for a period of 10 years. The details of rainfall at this station which may be taken as representative for the district as a whole are given in Tables 1 and 2. The average annual rainfall in the district is 957.1 mm. The rainfall in southwest monsoon season (June to September) is about 69% of the annual normal rainfall. July and August are the rainiest months contributing about 53% to the annual rainfall, while the rainfall in pre-monsoon months (March to May) account for 10% of the annual. The winter months (December to February) contribute rainfall for about 16% of the annual rainfall. In the period 1951 to 1995, the highest annual rainfall of 200% of the normal was recorded in year 1968, while the lowest was 28% of the normal recorded in 1967.

During this period, there was only one year in which the rainfall was less than 80% of the normal. It is seen from Table 2 that annual rainfall was between 701 mm and 1200 mm in 5 years out of 7. Rainfall generally occurs less at high peaks and lee side areas i.e. northern part of the district where moisture less winds prevail. Considerable amount of precipitation is received in the form of snowfall in high altitudinal areas of the district during winter season.

On an average there are 49 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district.

The heaviest rainfall recorded in 24 hours at any station in the district was 143.3 mm at Nowshera on 25th September 1954.

TEMPERATURE

There is no meteorological observatory in the district hence the meteorological parameters recorded at Katra observatory at an elevation of approximately 1170 metres in Reasi district and Jammu observatory at an elevation of approximately 367 metres in Jammu district may be taken as representative for this district. Nowshera is the headquarters of the district situated at an elevation of about 599 metres. The elevation of the district varies from south to north (500 m to about 4535 m) as temperature and other meteorological conditions depend on the topography it varies from place to place. The southern part is of low lying land which is generally warmer as compared the northern part (hilly terrain). The cold season is from the middle of November to mid-March. Temperatures begin to decrease from the middle of November. January is the coldest month with mean maximum temperature of about 18°C and mean minimum temperature of about 7°C at Nowshera town. In association with cold waves, minimum temperature may sometimes drop to below 1°C on individual days. The day and night temperature begin to rise from March till June. June is the hottest month with mean maximum temperature of about 38°C and mean minimum temperature is 25°C. Summers are hot while temperatures only go down marginally in the monsoon months. On individual days during the period April to June, the maximum

temperature may sometimes reach 45°C. The temperatures may be 10°C to 15°C lower in hilly areas and 1°C high in the plain area with reference to Nowshera city. Weather is pleasant in month of March to June and in October and November.

HUMIDITY

The atmosphere over the district is generally humid during the period July to September when values of relative humidity are about 70% to 80%. The period of April to June is the driest part of the year especially in the afternoons when relative humidity is about 40% to 50%. In the rest of the year relative humidity is about 60% to 70%.

CLOUDINESS

During the monsoon months July and August skies are heavily clouded to overcast. Cloudiness decreases thereafter and skies are very lightly clouded in the rest of the year except in the period of December to March when the skies are moderately clouded to overcast due to western disturbance. In the winter season, the skies sometimes are obscured in the morning due to lifted fog which clears with the advance of day.

WINDS

Winds are generally light to moderate throughout the year. Winds are mostly easterly throughout the year in the mornings. During latter part of pre-monsoon and monsoon season winds also blow from southeast direction in the mornings. While westerly wind is predominant in the afternoons, winds with southwesterly component is also noticed on some days during the period February to July in the afternoons.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year. Its frequency is more in the period March to September but subsequently reduces its activity being least in the winter months of November to January. Thunderstorms are sometimes accompanied with hail. Its frequency is more, being the highest during the period March to May, while it is occasionally noticed in other months. Dust storms do occur occasionally in pre-monsoon months. Fog is common during the winter months.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
RAJOURI

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Nowshera	10	a	59.4	67.6	51.6	23.6	24.9	46.2	255.6	254.6	100.2	40.3	11.2	21.9	957.1	200	28	143.3	25 Sep 1954
		b	3.2	5.2	4.4	2.5	2.1	3.6	10.3	10.0	3.5	1.4	.5	2.1	48.8	(1968)	(1967)		
Rajouri (District)		a	59.4	67.6	51.6	23.6	24.9	46.2	255.6	254.6	100.2	40.3	11.2	21.9	957.1	200	28		
		b	3.2	5.2	4.4	2.5	2.1	3.6	10.3	10.0	3.5	1.4	.5	2.1	48.8	(1968)	(1967)		

a: Normal rainfall in mm.

b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

* Based on all available data.

** Years of occurrence given in brackets.

TABLE - 2
FREQUENCY OF ANNUAL R/F IN THE DISTRICT
(DATA 1951 - 1995)
RAJOURI

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS
201 - 300	1	1101 - 1200	1
301 - 400	0	1201 - 1300	0
401 - 500	0	1301 - 1400	0
501 - 600	0	1401 - 1500	0
601 - 700	0	1501 - 1600	0
701 - 800	0	1601 - 1700	0
801 - 900	1	1701 - 1800	0
901 - 1000	1	1801 - 1900	0
1001 - 1100	2	1901 - 2000	1

(Data available for 7 years)

RAMBAN DISTRICT

Ramban district is situated in Jammu valley having an average elevation at about 1156 metres above mean sea level. The district is all mountainous with tough terrain. Ramban town is located at altitude about 723 metres on the bank of the river Chenab and peak height in the district is 3280 metres.

The district has a sub-tropical extreme climate while it is hot and dry in summer and cold temperate type in winter. Nights are generally cool being in the foothills of the mountains. Winter starts from the middle of November when both day and night temperatures fall rapidly till early February. The temperatures start to rise from March to July and remain steady till September. The period of mid-March to June is of summer season and is followed by southwest monsoon season till September. October to mid-November is of post monsoon season.

RAINFALL

Records of rainfall in the district are available for three raingauge stations for a period ranging from 12 to 40 years. The details of rainfall at these stations and for the district as a whole are given in Tables 1 and 2. The average annual rainfall in the district is 1330.7 mm. The annual rainfall in the district varies over a large range. The rainfall in southwest monsoon season (June to September) is about 30% of annual normal rainfall, while pre-monsoon months (March to May) contribute 31% of the annual rainfall, March being the month with the highest rainfall with an average of 211.7 mm. The winter months (December to February) contribute about 33% rainfall of the annual. In the period 1951 to 2000, the highest annual rainfall of 155% of the normal was recorded in year 1990, while the lowest was 30% of the normal recorded in 1952. During this period, there were nine years in which the rainfall was less than 80% of the normal. Such a low rainfall occurred in two consecutive years twice and in three consecutive years once. It is seen from Table 2 that annual rainfall was between 1001 mm and 1600 mm in 19 years out of 35 for which whole year data is available.

In the district especially in high mountains, significant amount of precipitation is received in the form of snow. Snowfall mainly occurred in the winter months; November to March. About 80% of snowfall occurred in the months of December to February.

On an average there are 68 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 47 at Ramban to 84 at Batote observatory.

The heaviest rainfall recorded in 24 hours at any station in the district was 255.4 mm at Batote observatory on 23rd August 1996.

TEMPERATURE

There are two meteorological observatories at Banihal and Batote at elevations of approximately 1630 and 1585 metres respectively in the district. Ramban town is the headquarters of the district situated at an elevation of 723 metres. The climate of the district varies according to its altitude. The temperatures are high in low-lying areas like Ramban town located in between steep mountains and Chenab river. The meteorological parameters recorded at these observatories may be taken to describe the climate for this district. Temperature and other meteorological conditions depend on the topography of the place. Winter season is from the middle of November to mid-March. Temperatures begin to decrease from the middle of November till early February. January is the coldest month with mean maximum temperature of about 10°C and mean minimum temperature of about 0.5°C. While in the low lying area like district headquarters Ramban both the temperatures are 4°C to 6°C high with reference to observatory stations. In association with cold waves, the minimum temperature may sometimes drop to below -10°C on individual days. The day and night temperatures both begin to rise from March and continue till July and remain more or less equal up to August. The day temperature reaches its highest in June or July, which is the hottest month with mean maximum temperature of about 28.0°C and mean minimum temperature is 17.6°C. While at Ramban mean maximum and minimum temperatures are about

34°C and 22°C respectively. On some days, during the period May to July the maximum temperature reaches 35°C in higher altitudes and about 40°C at low lying area like Ramban. The temperatures are 5°C-10°C lower at high elevated areas with reference to Banihal/Batote. The period of summer and post monsoon season is of pleasant with cool atmosphere.

The highest maximum temperature and lowest minimum temperature ever recorded in the district are 36.6 °C on 31st May 1988 at Batote observatory and -13.6°C on 12th December 1964 at Banihal observatory respectively.

HUMIDITY

The atmosphere over the district is generally humid throughout the year. It is slightly less humid during April to June and October to December especially in the afternoons when relative humidity is about 45% but in other months the humidity is around 80%.

CLOUDINESS

Skies are heavily clouded to overcast during the period January to April. In the winter season, the skies sometimes are obscured in the morning due to lifted fog which clears with the advance of day. Cloudiness decreases thereafter till June and during the period of July and August skies are again heavily clouded to overcast on some days. From September to November skies are lightly clouded. The cloudiness is more in the afternoons than mornings.

WINDS

Winds are generally light throughout the year. The district being hilly and mountainous local winds such as anabatic and katabatic winds determine speed and direction of wind at places. In northern part of the district at Banihal northerly wind is predominant throughout the year except during period June to September when

calm condition prevails in the mornings and southerly wind is predominant in the afternoons. While in southern part of the district at Batote northwesterly wind in the mornings and southwesterly wind in the afternoons are predominant. On other occasions especially during the period post May calm condition generally prevails.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year. Its frequency is more in the period March to July and reduces post July with the activity being least in the winter months November to March. Thunderstorms are occasionally accompanied with hails. Dust-storms occur rarely during the months February, March and November in the southern part of the district. Fog is common almost throughout the year with its occurrence being more during the winter months.

Table 3, 4, 5 and 6 and Table 3(a), 4(a), 5(a) and 6(a) give the temperature, relative humidity, cloudiness, mean wind speed and predominant wind directions, special weather phenomena respectively for Banihal and Batote observatories.

**TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
RAMBAN**

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Ramban	12	a b	116.3 5.4	133.7 5.5	103.7 5.9	67.9 3.8	53.6 3.1	34.6 2.6	119.3 6.1	113.0 6.1	114.8 3.2	37.8 1.5	13.2 0.7	83.5 3.6	991.4 47.5	150 (1966)	40 (1952)	177.5	24 Sep 1954
Banihal Obsy	40	a b	156.9 7.4	209.8 8.7	241.4 10.2	136.3 8.4	92.4 6.8	54.2 3.8	105.6 7.7	105.0 6.5	65.4 3.9	38.1 2.5	57.4 3.0	100.5 4.6	1363.0 73.5	146 (1996)	49 (1971)	205.6	28 Aug 1997
Batote Obsy	23	a b	161.0 7.2	232.8 8.9	289.9 10.3	137.3 7.3	109.3 7.9	96.5 6.4	171.1 10.4	142.2 8.7	79.9 5.4	48.7 3.7	60.7 3.0	108.2 4.6	1637.6 83.8	126 (1990)	64 (1999)	255.4	23 Aug 1996
Ramban (District)		a b	144.7 6.7	192.1 7.7	211.7 8.8	113.8 6.5	85.1 5.9	61.8 4.3	132.0 8.1	120.1 7.1	86.7 4.2	41.5 2.6	43.8 2.2	97.4 4.3	1330.7 68.4	155 (1990)	30 (1952)		

a: Normal rainfall in mm.

b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

* Based on all available data.

** Years of occurrence given in brackets.

TABLE - 2
FREQUENCY OF ANNUAL R/F IN THE DISTRICT
(DATA 1951 - 2000)
RAMBAN

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS
301 - 400	1	1201 - 1300	2
401 - 500	0	1301 - 1400	7
501 - 600	1	1401 - 1500	3
601 - 700	1	1501 - 1600	4
701 - 800	1	1601 - 1700	4
801 - 900	1	1701 - 1800	2
901 - 1000	2	1801 - 1900	1
1001 - 1100	2	1901 - 2000	1
1101 - 1200	1	2001 - 2100	1

(Data available for 35 years)

TABLE - 3
Normals of Temperature and Relative Humidity
(BANIHAL)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity %	
	°C	°C	°C	Date	°C	Date	0830 IST	1730 IST
January	9.8	-0.4	22.6	18.01.2003	-12.0	25.01.1964	75	57
February	10.8	0.6	25.3	10.02.1993	-10.0	22.02.1984	75	56
March	15.6	4.0	29.0	31.03.2007	-6.4	09.03.1979	72	52
April	21.9	8.3	31.8	30.04.2007	-0.7	16.04.1983	65	46
May	25.3	11.1	35.2	23.05.2000	3.0	01.05.2004	63	46
June	28.7	14.6	36.3	24.06.1993	6.3	15.06.1964	63	45
July	28.3	17.4	34.6	01.07.1964	10.3	03.07.2009	80	61
August	28.0	16.8	32.2	08.08.1979	8.7	25.08.1996	85	64
September	27.0	12.5	33.0	08.09.1994	5.1	25.09.1982	84	59
October	24.1	6.8	32.0	05.10.2000	0.8	02.10.2009	74	48
November	18.9	3.4	27.9	09.11.2008	-2.4	27.11.1997	67	44
December	13.7	1.1	23.8	04.12.1988	-13.6	12.12.1964	63	48
Annual	21.1	8.2	36.3	24.06.1993	-13.6	12.12.1964	72	52

TABLE - 4
Mean Cloud Amount *(Okta of the Sky) and Mean Number
of days of Clear and Overcast Skies
(BANIHAL)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	8	7	7	11	15	14	4	3	11	21	17	13	137
b	10	9	10	6	4	3	10	9	4	2	3	5	68
c	4.1	4.3	4.5	3.4	3	2.3	4.9	4.7	2.8	1.4	2.1	3.2	3.4
1730 HOURS IST													
a	8	5	3	4	3	3	1	1	3	13	14	12	66
b	11	10	13	8	7	4	6	6	4	2	3	5	72
c	4.3	4.8	5.2	4.9	4.7	4	4.7	4.8	3.8	2.5	2.5	3.4	4.1

- a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** Okta = Unit equal to area of one eighth of the sky used in specifying cloud amount.
For example: 1 Okta means 1/8th of the sky covered.

TABLE - 5
Mean Wind Speed and Predominant Wind Direction
(BANIHAL)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind Speed in km/hr	Data not available												
Direction in morning	C/N	C/N	C/N	C/N	C/N	C	C	C	C	C	C/N	C/N	
Direction in evening	C/N	C/N	C/N	C/N	C/N	C/S/N	C/S	C/S	C/S	C/N	C/N	C/N	

TABLE - 6
Special Weather Phenomena
(BANIHAL)

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.8	1.8	4.3	6.3	10.7	7.3	4.9	3.4	4.3	2.7	1.3	0.7	48.4
Hail	0.1	0.3	0.7	0.5	0.6	0.2	0.0	0.0	0.0	0.0	0.2	0.0	2.6
Dust-storm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fog	0.1	0.2	0.0	0.0	0.1	0.0	0.2	0.4	0.0	0.0	0.0	0.0	1.0
Squall	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TABLE – 3(a)
Normals of Temperature and Relative Humidity
(BATOTE)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity %	
	°C	°C	°C	Date	°C	Date	0830 IST	1730 IST
January	10.3	1.2	22.6	30.01.1995	-5.7	15.01.2000	72	66
February	11.5	2.1	23.7	08.02.1993	-7.2	22.02.1984	73	67
March	15.2	5.1	26.8	17.03.2004	-3.0	09.03.1979	70	62
April	21.8	9.8	31.2	30.04.1993	1.2	09.04.1984	59	52
May	25.8	12.9	36.6	31.05.1988	3.2	13.05.1987	58	48
June	28.7	16.2	36.3	09.06.1995	8.0	10.06.1981	61	51
July	26.6	17.9	34.2	01.07.1977	11.0	11.07.1993	81	73
August	26.4	17.6	32.5	01.08.1987	10.8	05.08.1987	84	76
September	25.6	14.4	29.7	12.09.2008	7.8	26.09.1984	76	72
October	23.1	9.4	29.2	03.10.2009	3.1	19.10.1987	62	57
November	18.1	5.5	26.1	09.11.2008	-1.2	28.11.1986	64	57
December	13.6	3.1	22.1	01.12.2008	-3.8	19.12.1986	61	55
Annual	20.7	9.8	36.6	31.05.1988	-7.2	22.02.1984	68	61

TABLE – 4(a)
Mean Cloud Amount ^{}(Okta of the Sky) and Mean Number**
of days of Clear and Overcast Skies
(BATOTE)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	10	7	6	12	13	14	3	4	12	23	18	13	136
b	8	8	9	5	4	3	12	7	3	1	2	5	65
c	3.9	4.2	4.3	3.1	2.6	2.2	4.9	4.5	2.6	1.1	1.9	3	3.2
1730 HOURS IST													
a	8	4	2	3	3	4	1	0	3	13	15	13	63
b	8	9	10	7	5	3	6	5	3	1	2	5	65
c	4.1	4.9	5.3	4.5	4.3	3.6	4.8	4.6	3.5	2.1	2.1	3.1	3.9

- a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
^{**} Okta = Unit equal to area of one eighth of the sky used in specifying cloud amount.
For example: 1 Okta means 1/8th of the sky covered.

TABLE – 5(a)
Mean Wind Speed and Predominant Wind Direction
(BATOTE)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind Speed in km/hr	1.9	2.0	2.4	2.8	2.5	2.8	2.8	2.4	2.4	2.2	1.8	1.8	2.3
Direction in morning	C/NW /SW	C/NW	C/NW	C/NW	C/NW	C/NW/ NE	C	C	C	C/NW/ SW	C/NW	C/NW	
Direction in evening	C/SW	C/SW	C/SW	C/SW	C/SW/ NW	C/SW	C/SW	SW	SW	SW	C/SW	C/SW	

TABLE – 6(a)
Special Weather Phenomena
(BATOTE)

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	1.0	2.7	5.5	5.4	8.5	7.2	5.2	3.3	3.9	2.3	1.4	0.4	46.9
Hail	0.1	0.7	0.4	0.9	0.5	0.2	0.1	0.0	0.0	0.1	0.3	0.2	3.4
Dust-storm	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.3
Fog	1.1	0.4	0.8	0.0	0.0	0.1	0.9	0.9	0.3	0.0	0.3	0.6	5.3
Squall	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

REASI DISTRICT

Reasi is mostly hilly district with the elevation up to 2480 metres above mean sea level. The district has some plains in southwest part and valleys of low elevation. The climatic conditions vary with ranging from sub-tropical to semi-temperate. Geographically the district can be divided into the hilly and low lying hilly areas. The district receives abundant rain in the monsoon season and sometimes snow at high altitudinal areas during winter season. District headquarters is Reasi town situated in the Shivalik hills at altitude 517 metres on the bank of Chenab river.

Summers are generally warm and winters are cold with snowfall on the high ridges. Winter starts by the middle of November and continues till early March. The period of March to end of June constitutes the pre-monsoon season, followed by southwest monsoon season till September. The period of October to mid-November is of post monsoon season.

RAINFALL

Records of rainfall in the district are available for two rain gauge stations for a period of 17 and 21 years. The details of rainfall at these stations and for the district as a whole are given in Tables 1 and 2. The average annual rainfall in the district is 2050.1 mm. The annual rainfall in the district varies over a large range. The rainfall in southwest monsoon season (June to September) is about 72% of the annual normal rainfall, while the rainfall in pre-monsoon months (March to May) accounts for 12% of the annual. August is the month with the highest rainfall with an average of 611.6 mm. The winter months (December to February) also account for about 13% of the annual normal rainfall. In the period 1951 to 2000, the highest annual rainfall of 155% of the normal was recorded in year 1988, while the lowest was 50% of the normal recorded in 1951. During this period, there were 8 years in which the rainfall was less than 80% of the normal and there was one occasion when such low rainfall occurred in four consecutive years. It is seen from Table 2 that annual rainfall was between 1601 mm and 2500 mm in 12 years out of 26.

In the district especially in higher mountains, precipitation is received in the form of snow. About 14 cm of snow occurs annually in the district. Snowfall mainly occurs in the winter months; November to February.

On an average there are 75 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district.

The heaviest rainfall recorded in 24 hours at any station in the district was 292.4 mm at Katra (Observatory) on 25th September 1988.

TEMPERATURE

There is one meteorological observatory at Katra situated at an elevation of approximately 1170 metres in the district. The meteorological parameters recorded at this observatory may be taken to describe the climatic conditions for this district. The elevation of the district varies from 400 to 2480 metres and as temperature and other meteorological conditions depend on the topography it varies from place to place. The cold season is from the middle of November to mid-March. Temperatures begin to decrease from the middle of November till January. January is the coldest month with mean maximum temperature and mean minimum temperature at Katra are 17°C and 5.8°C respectively. Whereas mean maximum temperature of about 20°C and mean minimum temperature of about 8°C are experienced at district headquarters Reasi situated at about 517 metres. In association with cold waves, the minimum temperature may sometimes drop to below 0°C on individual days. The day and night temperatures both begin to rise from March and continue till July, while the day temperature reaches its maximum in June which is the hottest month with mean maximum temperature of about 39°C and mean minimum temperature of about 25°C at Reasi. Whereas at Katra mean maximum temperature and mean minimum temperatures are 35.6°C and 21.9°C respectively. Summers are hot while the temperatures only go down marginally in the monsoon months. On some days, during the period April to June the maximum temperature may sometimes reach 44°C. Both the temperatures are 3°C to 5°C lower at high altitudinal areas and 2°-3°C high at low lying areas with reference to Katra. The period of summer and post monsoon season is of pleasant with fair weather.

The highest maximum temperature ever recorded at Katra observatory was 46.2°C on 05th June 1995 while the lowest minimum temperature ever recorded was – 1.0°C on 22nd February 1984.

HUMIDITY

The atmosphere over the district is generally humid during the period July to September when values of relative humidity are about 80%. The period from April to June is the driest part of the year especially in the afternoons when relative humidity is at about 40% to 50%. In the rest of the year values of the humidity are about 60 to 70%.

CLOUDINESS

During the monsoon months July and August skies are heavily clouded to overcast. Cloudiness decreases thereafter and skies are very lightly clouded in the rest of the year except in the period December to March when skies are moderately clouded to overcast when western disturbances affect the district. In the winter season, the skies are sometimes obscured in the morning due to lifted fog which clears with the advance of the day.

WINDS

Winds are generally light throughout the year. Winds are mostly easterly throughout the year in the mornings. During latter part of pre-monsoon and southwest monsoon season, winds also blow from southeast direction in the mornings, while westerly wind is predominant in the afternoons throughout the year and southwesterly component is also noticed on some days during the period February to July in the afternoons.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year. Its frequency is more in the period March to September but subsequently reduces its activity being least in the winter months. Thunderstorms are sometimes accompanied with hails. Its frequency is more during the period March to May, while it is occasionally noticed in other months. Dust storms occur occasionally in pre-monsoon months. Fog is common during the winter and monsoon season.

Table 3, 4, 5 and 6 give the normals of temperature and relative humidity, cloudiness, mean wind speed and wind direction, special weather phenomena respectively for Katra observatory.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
REASI

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Reasi	17	a b	107.8 4.6	76.0 4.1	86.2 5.0	46.0 3.2	36.2 2.4	82.3 4.5	446.9 12.5	574.4 15.0	242.3 7.6	42.1 1.7	12.1 0.6	56.8 2.3	1809.1 63.5	175 (1959)	56 (1951)	223.3	04 Jul 1959
Katra (Obsy)	21	a b	101.0 5.2	131.6 5.8	155.7 7.3	95.7 4.9	59.2 4.4	118.6 7.0	630.2 17.8	648.8 17.9	209.0 8.3	38.9 2.8	28.8 1.6	73.3 3.0	2290.8 86.0	139 (1988)	61 (1987)	292.4	25 Sep 1988
Reasi (District)		a b	104.4 4.9	103.8 5.0	121.0 6.2	70.9 4.1	47.7 3.4	100.5 5.8	538.5 15.1	611.6 16.0	225.6 8.0	40.5 2.2	20.5 1.1	65.1 2.7	2050.1 75.0	155 (1988)	50 (1951)		

- a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data.
** Years of occurrence given in brackets.

TABLE - 2
FREQUENCY OF ANNUAL R/F IN THE DISTRICT
(DATA 1951 - 2000)
REASI

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS
1001 - 1100	1	2101 - 2200	1
1101 - 1200	0	2201 - 2300	1
1201 - 1300	0	2301 - 2400	1
1301 - 1400	3	2401 - 2500	1
1401 - 1500	0	2501 - 2600	1
1501 - 1600	3	2601 - 2700	1
1601 - 1700	2	2701 - 2800	0
1701 - 1800	3	2801 - 2900	1
1801 - 1900	1	2901 - 3000	1
1901 - 2000	1	3001 - 3100	1
2001 - 2100	1	3101 - 3200	2

(Data available for 26 years)

TABLE - 3
Normals of Temperature and Relative Humidity
(KATRA)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity %	
	°C	°C	°C	Date	°C	Date	0830 IST	1730 IST
January	17.0	5.8	23.4	03/01/1994	0.3	17/01/1995	73	70
February	18.9	7.3	28.8	11/02/1993	-1.0	22/02/1984	68	63
March	22.8	11.0	32.8	31/03/1999	3.0	07/03/1982	61	55
April	29.0	15.8	39.3	30/04/1999	5.5	07/04/1994	50	42
May	33.9	19.8	43.7	31/05/1988	10.0	21/05/1986	44	49
June	35.6	21.9	46.2	05/06/1995	14.2	05/06/1999	52	42
July	31.2	21.4	39.7	05/07/1987	16.2	25/07/1999	82	75
August	30.1	20.8	36.3	03/08/1987	10.8	23/08/1998	87	83
September	30.1	18.8	33.4	07/09/1988	10.0	07/09/1992	79	75
October	28.2	14.4	32.9	11/10/1993	9.0	30/10/1982	65	62
November	24.1	10.5	29.1	26/11/1992	4.6	20/11/1996	66	64
December	19.6	7.3	27.6	07/12/1998	1.1	30/12/1997	67	68
Annual	26.9	14.8	46.2	05/06/1995	-1.0	22/02/1984	66	61

TABLE – 4
Mean Cloud Amount ** (Okta of the Sky) and Mean Number
Of days of Clear and Overcast Skies
(KATRA)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	16	12	15	16	18	17	6	7	15	22	22	19	185
b	6	5	6	3	2	3	12	10	3	2	1	4	57
c	3.2	3.2	3.5	2.6	2.1	2.1	4.8	4.3	2.3	1.3	1.4	2.5	2.8
1730 HOURS IST													
a	14	9	10	10	11	10	3	2	9	20	19	17	134
b	7	6	5	3	3	3	7	7	2	1	1	4	49
c	3.5	3.9	4	3.1	3	2.9	5	4.9	3	1.5	1.7	2.6	3.3

- a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** Okta = Unit equal to area of one eighth of the sky used in specifying cloud amount.
For example: 1 Okta means 1/8th of the sky covered.

TABLE - 5
Mean Wind Speed and Predominant Wind Direction
(KATRA)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind Speed in km/hr	1.6	2.0	2.4	2.2	2.3	1.9	1.6	1.4	1.2	1.2	1.0	1.3	1.7
Direction in morning	C/E	C/E	C/E	C/E/ SE	C/E/ W/SE	C/E/ SE	C/E/ SE	C/E/ SE	C/E/ SE	C/E	C/E	C/E	
Direction in evening	C/W	C/W/ SW	C/W/ SW	C/W/ SW	C/W	C/W	C/W/ SW	C/W	C/W	C/W	C/W	C/W	

TABLE - 6
Special Weather Phenomena
(KATRA)

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	1.6	1.8	3.7	3.5	4.8	4.7	7.5	5.1	4.0	1.9	0.6	0.7	39.9
Hail	0.3	0.1	0.5	0.3	0.4	0.1	0.1	0.1	0.0	0.1	0.1	0.2	2.3
Dust-storm	0.1	0.0	0.2	0.1	0.3	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.9
Fog	0.6	0.4	0.2	0.0	0.0	0.1	1.1	0.7	0.2	0.0	0.8	0.3	4.4
Squall	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

SAMBA DISTRICT

Samba district falls in the foothills of the Himalayas. The district has mostly low lying land and Shivalik range rises gradually from the northern part of the district. Samba town is situated at an elevation of 384 metres above mean sea level in the Shivalik range.

Samba district has a sub-tropical extreme climate while it is hot and dry in summer, and cold in winter. Nights are generally cool in the district being in the foothills of the mountains. Winter starts from December when both the day and night temperatures fall rapidly till mid-February. The temperatures start to rise from March till June. December to February is the winter season while March to last week of June is the summer season followed by southwest monsoon season till September. The period of October and November constitutes the transition period (post monsoon season) between southwest monsoon season and winter.

RAINFALL

Records of rainfall in the district are available for only one raingauge station for a period of 65 years. The details of rainfall at this station which may be taken as representative for the district as a whole are given in Tables 1 and 2. The average annual rainfall in the district is 1116.2 mm. The variation in the annual rainfall from year to year is a large in the district. The rainfall in southwest monsoon season (June to September) is about 75% of the annual normal rainfall. August is the rainiest month with an average rainfall of 345.3 mm. In July and August the district receives good amount of rainfall about 59% of the annual rainfall. The rainfall in pre-monsoon months (March to May) is about 9% of the annual. The winter months (December to February) also contribute the rainfall about 14% of the annual normal rainfall. In the period 1901 to 1969, the highest annual rainfall of 181% of the normal was recorded in year 1917, while the lowest was 39% of the normal recorded in 1902. During this period there were 15 years in which the rainfall was less than 80% of the normal and there were three occasions of two consecutive years of such low rainfall. It is seen from Table 2 that the annual rainfall was between 901 mm and 1400 mm in 28 years out of 57.

On an average there are 43 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district.

The heaviest rainfall recorded in 24 hours at any station in the district was 241.6 mm at Samba on 9th August 1914.

TEMPERATURE

There is no meteorological observatory in the district hence the meteorological parameters recorded at Jammu at an elevation of approximately 367 metres in the neighboring Jammu district may be taken as representative for this district. The elevation of the district varies from 100 metres to about 600 metres and as temperature and other meteorological conditions depend much on the topography it varies from place to place. Both the temperatures begin to decrease from middle of November and January is the coldest month with mean maximum temperature of about 19°C and mean minimum temperature of about 8°C. In association with cold waves, the minimum temperature may sometimes drop to below 1°C on individual days. The day and night temperatures both begin to rise from the middle of February and attain maximum values in June, which is the hottest month with mean maximum temperature of about 39°C and mean minimum temperature is 26°C. Summers are hot while the temperatures only go down marginally after monsoon onset. On some days, during the period April to June the maximum temperature sometimes reaches 45°C. The temperatures may be 1° - 2°C more or less in the parts of district. Weather becomes gradually cool after withdrawal of southwest monsoon and pleasant in October and November.

HUMIDITY

The atmosphere over the district is generally humid during the period July to February especially in the mornings when relative humidity is at about 70% to 80%. In the afternoons during the same period it is at about 55% to 70%. It is slightly less

humid during April to June especially in the afternoons when relative humidity is about 30% to 40%, and in the morning it is about 50%.

CLOUDINESS

The skies are heavily clouded to overcast in the monsoon months July and August. In the period from September to November skies are very lightly clouded. During winter season and early part of pre-monsoon season skies are light to moderately clouded, however skies are heavily clouded to overcast on some days when western disturbances affect the district during this period.

WINDS

Winds are generally light to moderate in latter part of summer and early part of monsoon season. Winds blow from northeast direction throughout the year in the mornings. There is a easterly component observed in the mornings on some days during the period July and August, while westerly or southwesterly winds are predominant during the period January to October in the afternoons. Northwesterly wind which is predominant in the afternoons during November and December is also observed on some days during January to June.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year. Its frequency is more in the period March to September but subsequently reduces its activity after September being least in the winter months (November to January). Thunderstorms in summer are occasionally accompanied with hails and squalls. Hail during the period March to May is the highest, while it is occasionally noticed in other months. Dust storms occasionally occur in dry spells during the period February to November and its frequency is maximum in May and June. Fog is common during the winter months.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
SAMBA

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Samba	65	a	65.3	53.3	52.7	22.7	20.3	54.0	316.7	345.3	125.0	19.9	7.3	33.7	1116.2	181	39	241.6	09 Aug 1914
		b	3.2	3.1	2.8	1.5	1.4	2.7	10.4	10.8	4.3	0.7	0.4	1.6	42.9	(1917)	(1902)		
Samba (District)		a	65.3	53.3	52.7	22.7	20.3	54.0	316.7	345.3	125.0	19.9	7.3	33.7	1116.2	181	39		
		b	3.2	3.1	2.8	1.5	1.4	2.7	10.4	10.8	4.3	0.7	0.4	1.6	42.9	(1917)	(1902)		

a: Normal rainfall in mm.

b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

* Based on all available data.

** Years of occurrence given in brackets.

TABLE - 2
FREQUENCY OF ANNUAL R/F IN THE DISTRICT
(DATA 1901 - 1969)
SAMBA

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS
401 - 500	2	1301 - 1400	7
501 - 600	0	1401 - 1500	3
601 - 700	4	1501 - 1600	3
701 - 800	4	1601 - 1700	1
801 - 900	7	1701 - 1800	1
901 - 1000	5	1801 - 1900	1
1001 - 1100	7	1901 - 2000	2
1101 - 1200	7	2001 - 2100	1
1201 - 1300	2		

(Data available for 57 years)

SHOPIAN DISTRICT

Shopian district has hilly terrain and valleys. The district with its head quarters at Shopian (altitude 2146 m) lies in the southern part of Kashmir valley. The altitude of the hill ranges up to about 3700 metres above mean sea level. The valley area in the central part of the district has flat to mildly undulating topography with its elevation about 1600 m. It has an average altitude of 2057 m which is flanked by lofty Himalayas from all sides.

Most of the higher reaches in the district experience snowfall in winters. Winter season starts from the middle of November and severe cold conditions continue till early March. The temperatures begin to rise from March till June. The pre-monsoon/summer season is from the middle of March to the end of June and is followed by southwest monsoon season till September. When monsoon is strong, rain is caused. The succeeding period lasting till mid-November is of post monsoon season.

RAINFALL

Records of rainfall in the district are available for only one raingauge station for a period of 29 years. The details of rainfall at this station which is representative for the district as a whole are given in Tables 1 and 2. The average annual rainfall in the district is 818.8 mm. The variation in the annual rainfall from year to year is large in the district. The rainfall in southwest monsoon season (June to September) is about 32% of the annual normal rainfall, while the rainfall in pre-monsoon months (March to May) accounts for 40% of the annual, April being the month with the highest rainfall with an average of 121.4 mm. The winter months (December to February) contribute the rainfall of about 20% of the annual normal rainfall. In the period 1960 to 1996, the highest annual rainfall of 206% of the normal was recorded in year 1972, while the lowest rainfall was 49% of the normal recorded in 1977. During this period, there were 5 years in which the rainfall was less than 80% of the normal and there was one occasion when such low rainfall occurred in two consecutive years. It is seen from Table 2 that the annual rainfall was between 601

mm and 1000 mm in 9 years out of 17. In the district especially in high altitudinal areas, considerable amount of precipitation is received in the form of snow during winter.

On an average there are 60 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district.

The heaviest rainfall recorded in 24 hours in the district was 131 mm at Shopian on 1st August 1976.

TEMPERATURE

There is no meteorological observatory in the district hence the meteorological parameters recorded at Quazigund observatory at an elevation of approximately 1690 m in the neighbouring Kulgam district may be taken as representative for this district. Temperatures and other meteorological conditions depend on the topography of the place hence; the climate also varies from place to place. The winter season begins from the middle of November when temperatures begin to decrease and severe winter condition continues till February. January is the coldest month with mean maximum temperature of about 5°C and mean minimum temperature of about -5°C at Shopian town. In association with cold waves, the minimum temperature may sometimes drop to below -17°C on individual days. The day and night temperatures both begin to rise from March and continue till July, while the day temperature reaches its highest in July and August. July is the hottest month with mean maximum temperature of about 26°C and mean minimum temperature is 15°C at Shopian town. On individual days during the period May to August, the maximum temperature may sometimes reach 35°C. Both the temperatures are 3°C to 8°C lower over the places situated at higher altitudes in surrounding mountains and 2° -3°C higher in valleys of low elevation with reference to Shopian town.

HUMIDITY

The atmosphere over the district is generally humid throughout the year especially in the mornings when relative humidity is at about 70% to 90%. It is slightly less humid during the afternoons when relative humidity is at about 50% to 70% throughout the year. The humidity is less in the months of April to June.

CLOUDINESS

The skies are heavily clouded to overcast during winter months December to March, thereafter cloudiness decreases and skies are moderately clouded till June. In months of July and August again cloudiness increases and skies become overcast on some days. Generally mornings during the winter season are much cloudy than afternoons. The hill-tops are frequently enveloped with clouds. In the winter season sky sometimes becomes obscured in the mornings due to lifted fog which clears with the advance of the day.

WINDS

Winds are generally light or calm in the mornings and evenings throughout the year and they mostly blow from south/southwest/west direction throughout the year. Easterly winds are also observed on some days in the mornings during the months May to July. The district being hilly local winds such as anabatic and katabatic winds determine speed and direction of wind at places.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year. Its frequency is more in the period March to September and thereafter reduces with the activity being least in the winter months November to March. Hail is rather rare and confined to the period March to June. Thunderstorms occur in the summer months and sometimes are associated with dust storms. Fog is common during the winter months.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
SHOPIAN

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Shopian	29	a	48.4	72.8	119.0	121.4	90.7	42.6	84.9	92.0	46.2	31.9	28.8	40.1	818.8	206	49	131.0	01 Aug1976
		b	3.8	4.3	7.8	8.5	7.5	4.0	6.3	6.5	3.4	2.4	2.5	2.8	59.8	(1972)	(1977)		
Shopian (District)		a	48.4	72.8	119.0	121.4	90.7	42.6	84.9	92.0	46.2	31.9	28.8	40.1	818.8	206	49		
		b	3.8	4.3	7.8	8.5	7.5	4.0	6.3	6.5	3.4	2.4	2.5	2.8	59.8	(1972)	(1977)		

a: Normal rainfall in mm.

b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

* Based on all available data.

** Years of occurrence given in brackets.

TABLE - 2
FREQUENCY OF ANNUAL R/F IN THE DISTRICT
(DATA 1960 - 1996)
SHOPIAN

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS
301 - 400	1	1001 - 1100	1
401 - 500	2	1101 - 1200	1
501 - 600	1	1201 - 1300	1
601 - 700	3	1301 - 1400	0
701 - 800	5	1401 - 1500	0
801 - 900	1	1501 - 1600	0
901 - 1000	0	1601 - 1700	1

(Data available for 17 years)

SRINAGAR DISTRICT

Srinagar is a hilly district located in the center of the Kashmir valley. Srinagar town is the district headquarters situated at an altitude of 1,587 metres above sea level, spread on both sides of the river Jhelum. The Dal and Nagin lakes enhance the beauty of the district. It is the summer capital of the state. The highest peak in the district is at about 5148 m. As such altitudinal variation, there is a wide variation in climatic conditions in the district experiencing temperate and mediterranean climate in high altitude which experience snowfall and severe cold in the winter. The winter is cold and commences from the middle of November and lasts till mid-March. In higher mountains round the valleys, winter is very cold associated with snowfall. During these months strong winds bring rain and snow from Mediterranean depressions. The pre-monsoon (summer) season is from mid-March to the end of June and is followed by southwest monsoon till September. Sometimes heavy rain occurs during winter and summer months. When the monsoon is strong, rain is caused. The period of October to mid-November is of post monsoon season.

RAINFALL

Records of rainfall in the district are available for one rain gauge station i.e. Srinagar observatory for a period of 50 years. The details of rainfall at this station which may be taken as representative for the district as a whole are given in Tables 1 and 2. The average annual rainfall in the district is 698 mm. The annual rainfall in the district does not vary much over a large range. The rainfall in southwest monsoon season (June to September) is about 27% of the annual normal rainfall, while the rainfall in pre-monsoon months (March to May) accounts for 39% of the annual, March being the month with the highest rainfall with an average of 111.4 mm. The winter months (December to February) account for about 24% of the annual normal rainfall. In the fifty-year period 1951 to 2000, the highest annual rainfall of 168% of the normal was recorded in year 1957, while the lowest was 52% of the normal recorded in 1971. During this period, there were 8 years in which the rainfall was less than 80% of the normal and there was one occasion each of two

consecutive years and three consecutive years when such a low rainfall occurred. It is seen from Table 2 that the annual rainfall was between 501 mm and 900 mm in 31 years out of 41.

In the district especially in higher mountains considerable amount of precipitation is received in the form of snow. About 29 cm of snowfall occurred annually in the district. Snowfall mainly occurred in the winter months November to March. About 75% of snowfall occurred in January to March.

On an average there are 56 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district.

The heaviest rainfall recorded in 24 hours at any station in the district was 105.0 mm at Srinagar on 29th December 1990.

TEMPERATURE

There is one meteorological observatory in the district at Srinagar at an elevation of approximately 1587 metres. Temperature and other meteorological conditions vary depending very much on the topography of the place. The description of climate that follows is based on the records of meteorological parameters recorded at this observatory which may be taken for the district. The cold season is from mid-November to mid-March. Temperatures begin to decrease from November till early February. January is the coldest month with mean maximum temperature of about 6.3°C and a mean minimum temperature of about -2.1°C. In association with cold waves, the minimum temperature sometimes drops to below -18°C on individual days. The day and night temperatures both begin to rise from March and continue till July, while the day temperature reaches its highest in July, which is the hottest month with mean maximum temperature of about 30°C and mean minimum temperature is 18.2°C. The day and night temperatures are more in the monsoon season than summer months. On some days during the period May to August the maximum temperature reaches about 36°C. Both the temperatures are

10°C to 15°C lower over the places situated at high altitudinal areas. Weather is pleasant in months of April to June and October.

The highest maximum temperature ever recorded at Srinagar observatory was 38.3°C on 10th July 1946 and lowest minimum temperature ever recorded was –20°C on 6th February 1895.

HUMIDITY

The atmosphere over the district especially in the morning is mostly humid throughout the year. The period from November to February is more humid when the values of relative humidity are about 90% in the mornings while it is slightly less humid during March to October especially in the afternoons when relative humidity is at about 45% to 55%.

CLOUDINESS

The skies are moderately clouded to overcast on many days in the period from December to April. In the winter season, the skies are sometimes obscured in the mornings due to lifted fog which clears with the advance of day. Cloudiness decreases slightly thereafter and skies are lightly clouded in the remaining year.

WINDS

Winds are generally light and they mostly blow from the southeast direction in the mornings throughout the year. Also sometimes strong winds blow during the pre-monsoon months along with thunderstorms. Sometimes northwesterly winds are also seen in the mornings during the period from January to August. Northwesterly winds are seen in the afternoons throughout the year. Westerly and southwesterly components are seen in the afternoons. On other occasions especially calm conditions generally prevail.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year except December. Its frequency is more in the period; latter part of pre-monsoon and southwest monsoon seasons i.e. April to September and thereafter the activity being least in winter months. Hail is rather rare and confined in winter and summer months. Fog is common almost throughout the year with its occurrence being more during the winter months.

Table 3, 4, 5 and 6 give the temperature, humidity, cloudiness, mean wind speed and predominant wind directions and special weather phenomena respectively for Srinagar observatory.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
SRINAGAR

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Srinagar (Obsy)	50	a	52.1	69.3	111.4	90.7	71.8	39.6	54.8	67.6	29.9	35.4	27.4	48.0	698.0	168	52	105.0	29 Dec 1990
		b	4.9	5.5	8.3	7.1	6.2	3.6	4.7	5.1	2.6	2.4	2.0	3.3	55.7	(1957)	(1971)		
Srinagar (District)		a	52.1	69.3	111.4	90.7	71.8	39.6	54.8	67.6	29.9	35.4	27.4	48.0	698.0	168	52		
		b	4.9	5.5	8.3	7.1	6.2	3.6	4.7	5.1	2.6	2.4	2.0	3.3	55.7	(1957)	(1971)		

- a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data.
** Years of occurrence given in brackets.

TABLE - 2
FREQUENCY OF ANNUAL R/F IN THE DISTRICT
(DATA 1951 – 2000)
SRINAGAR

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS
301 - 400	1	801 - 900	4
401 - 500	5	901 - 1000	3
501 - 600	6	1001 - 1100	0
601 - 700	13	1101 - 1200	1
701 - 800	8		

(Data available for 41 years)

TABLE – 3
Normals of Temperature and Relative Humidity
(SRINAGAR)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity %	
	°C	°C	°C	Date	°C	Date	0830 IST	1730 IST
January	6.3	-2.1	17.2	23.01.1902	-14.4	31-01-1893	93	72
February	8.8	-0.2	20.6	29.02.1940	-20.0	06-02-1895	90	65
March	13.9	3.6	27.3	27.3.1971	-6.9	03.03.1965	84	57
April	20.4	7.7	31.1	20.04.1946	0.0	02.04.1905	74	49
May	24.4	10.8	36.4	24.05.1968	1.0	01.05.2004	71	51
June	29.1	14.7	37.8	29.06.1978	7.2	03.06.1935	67	44
July	30.0	18.2	38.3	10.07.1946	10.3	05.07.2009	76	55
August	29.5	17.4	36.7	01.08.1946	9.5	31.08.1968	80	57
September	27.8	12.5	35.0	18.09.1934	4.4	30.09.1940	79	52
October	22.4	5.7	33.9	02.10.1931	-1.7	25.10.1934	81	54
November	15.6	1.0	24.5	01.11.2000	-7.8	29.11.1934	89	62
December	8.8	-1.6	18.3	01.12.1901	-12.8	13.12.1964	92	72
Annual	19.7	7.3	38.3	10.07.1946	-20.0	06.02.1895	81	58

TABLE – 4

**Mean Cloud Amount ** (Okta of the Sky) and Mean Number
Of days of Clear and Overcast Skies
(SRINAGAR)**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	3	2	3	6	8	11	3	3	11	17	13	6	86
b	15	13	11	7	5	2	6	5	3	2	4	12	85
c	6	6	5.4	4.2	3.5	2.5	4.5	4.4	2.9	2	3	4.9	4.1
1730 HOURS IST													
a	3	1	1	1	1	1	0	0	1	5	8	4	26
b	10	11	11	9	7	3	3	3	3	2	3	8	73
c	5.2	5.3	5.6	5.2	5.2	3.9	4.3	4.2	3.5	3	3.1	4.4	4.4

a: Days with clear sky.

b: Days with sky overcast.

c: Mean cloud amount in Okta.

** Okta = Unit equal to area of one eighth of the sky used in specifying cloud amount.

For example: 1 Okta means 1/8th of the sky covered.

TABLE - 5

**Mean Wind Speed and Predominant Wind Direction
(SRINAGAR)**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind Speed in km/hr	1.7	2.4	2.9	3.3	3.0	2.9	2.7	2.3	2.1	2.0	1.7	1.6	2.4
Direction in morning	C/SE/ NW	C/SE/ NW	C/SE/ NW	C/SE/ NW	C/SE/ NW	C/SE/ NW	C/SE/ NW	C/SE/ NW	C/SE	C/SE	C/SE	C/SE	
Direction in evening	C/NW/ W	C/NW	NW/C	NW/C	C/NW/ W	C/NW/ SW/W	C/NW/ SW/W	C/NW/ SW/SE	C/NW/ W/SW	C/NW/ W	C/NW	C/NW/ W	

TABLE - 6

**Special Weather Phenomena
(SRINAGAR)**

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.1	0.6	2.0	4.5	9.6	7.0	6.8	6.0	3.6	1.6	0.3	0.0	42.1
Hail	0.1	0.1	0.1	0.1	0.3	0.2	0.1	0.0	0.1	0.0	0.0	0.0	1.1
Dust-storm	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.1	0.0	0.0	0.1	0.7
Fog	1.9	0.9	0.0	0.1	0.1	0.1	0.1	0.3	0.2	0.1	1.4	1.5	6.7
Squall	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UDHAMPUR DISTRICT

Udhampur district has hilly terrain and valleys of low elevation and it is located in the Shivalik ranges of the Himalayas. The topography of the district varies from place to place in the district due to altitudinal variation from 500 m to 2500 metres above mean sea level. The climatic conditions vary from place to place due to topographic variation. There are some areas in the district which experience snowfall and severe cold during the winter season. The district receives good amount of rainfall in southwest monsoon season as well as in winter due to western disturbances.

Summers are generally warm and winters are very cold. Winter starts by the middle of November continues till early March. The period from March to last week of June constitutes the pre-monsoon season, followed by southwest monsoon season till September. The succeeding period lasting till the middle of November is post monsoon season.

RAINFALL

Records of rainfall in the district are available for two raingauge stations for period of 14 and 15 years. The details of rainfall at both the stations and for the district as a whole are given in Tables 1 and 2. The average annual rainfall in the district is 1820.2 mm. The rainfall in the southwest monsoon season (June to September) is about 68% of the annual normal rainfall, while the rainfall in the pre monsoon months (March to May) accounts for 12% of the annual. August is the rainiest month with an average rainfall of 484.8 mm. The winter months (December to February) also contribute for about 16% of the annual normal rainfall. In period 1951 to 1996, the highest annual rainfall of 152% of the normal was recorded in year 1956, while the lowest was 60% of the normal recorded in 1951. During this period, there were 3 years in which the rainfall was less than 80% of the normal however, none of them were consecutive years. It is seen from Table 2 that annual rainfall was between 1401 mm and 2200 mm in 7 years out of 14. Precipitation in the form of snow is received at high altitudinal areas of the district in winter.

On an average there are 68 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number is 67 at Udhampur and 69 at Ramanagar.

The heaviest rainfall recorded in 24 hours at any station in the district was 190.5 mm at Ramanagar 30th Aug 1961.

TEMPERATURE

There is no meteorological observatory in the district. The description of climate which follows is based on records of meteorological parameters of Katra observatory situated at an altitude of approximately 1170 metres in the neighboring district. The district headquarters is Udhampur town situated at elevation about 736 metres. The temperature and other meteorological conditions vary from place to place due to altitudinal variation in the district is from 500 metres to about 2500 metres. Topography in the district varies from place to place. The winter season begins from the middle of November. Temperatures begin to decrease from November till mid-February. January is the coldest month with mean maximum temperature of about 18°C and mean minimum temperature of about 7°C at Udhampur town. In association with cold waves, the minimum temperature may sometimes drop to below 1°C on individual days in some areas. The day and night temperatures both begin to rise from March and reach its maximum in June, which is the hottest month with mean maximum temperature of about 37°C and mean minimum temperature is 24°C. Summers are hot while the temperatures go down marginally in the monsoon months. On some days, during the period April to June the maximum temperature may sometimes reach 44°C. Both the temperatures are 5°C to 7°C lower at places situated at higher altitudes. The period of March to April and October to November is pleasant with fair weather.

HUMIDITY

The atmosphere over the district is generally humid during the period July to September when values of relative humidity are at about 80%. The period of April to June is the driest part of the year especially in the afternoons when relative humidity

is at about 40% to 50%. In the rest of the year values of relative humidity are about 60 to 70%.

CLOUDINESS

During the monsoon months July and August, skies are heavily clouded to overcast. Cloudiness decreases thereafter and the skies are very lightly clouded in the rest of the year except in the period December to March when skies are moderately clouded to overcast when western disturbances affect the district. In the winter season, the skies are sometimes obscured in the morning due to lifted fog which clears with the advance of the day.

WINDS

Winds are generally light throughout the year. Winds are mostly easterly throughout the year in the mornings. During latter part of pre-monsoon and southwest monsoon season winds also blow from southeast direction in the mornings. While westerly wind is predominant in the afternoons, winds with southerly component are also noticed on some days during the period February to July in the afternoons.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year. Its frequency is more in the period of March to September but subsequently reduces its activity being least in the winter months November and January. Thunderstorms are sometimes accompanied with hail. Its frequency is more during the period March to May while it is occasionally noticed in other months. Dust storms do occur occasionally in the per-monsoon months. Fog is common during the winter months.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
UDHAMPUR

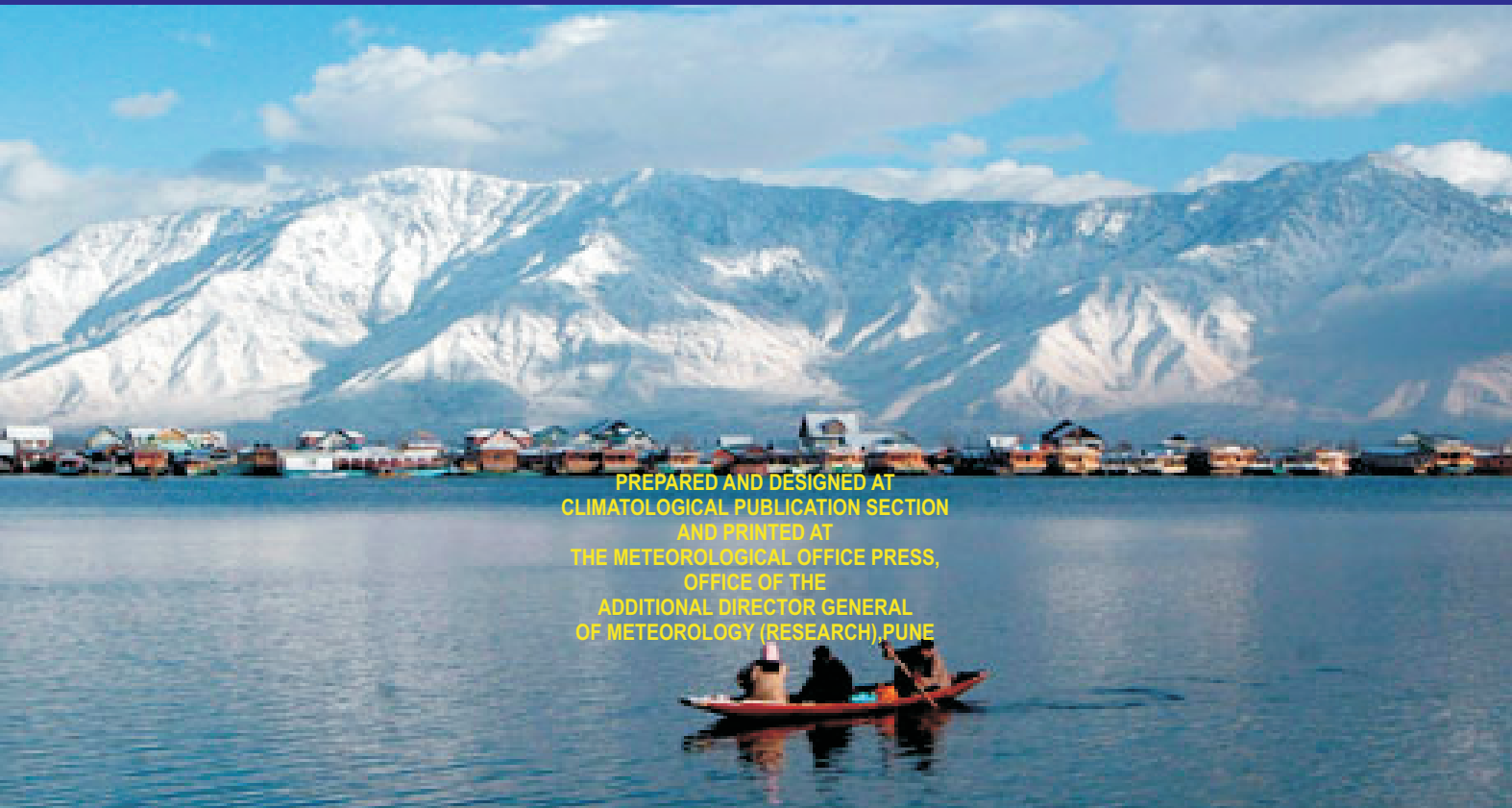
STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Ramanagar	14	a b	124.3 5.1	124.1 5.1	170.7 6.1	52.4 4.0	47.4 2.5	118.6 4.2	503.3 15.3	500.4 15.7	188.6 6.0	68.8 1.9	13.9 0.6	57.1 2.4	1969.6 68.9	175 (1956)	59 (1951)	190.5	30 Aug 1961
Udhampur	15	a b	115.7 4.9	104.9 4.9	115.4 6.1	36.6 3.2	22.9 2.1	64.1 3.7	398.6 13.4	469.3 16.3	229.9 8.1	46.1 1.8	20.0 0.9	46.7 2.0	1670.2 67.4	151 (1959)	52 (1969)	167.6	09 Jul 1953
Udhampur (District)		a b	120.0 5.0	114.5 5.0	143.1 6.1	44.5 3.6	35.2 2.3	91.4 3.9	451.0 14.4	484.8 16.0	209.3 7.1	57.5 1.8	17.0 1.8	51.9 2.2	1820.2 68.2	152 (1956)	60 (1951)		

- a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data.
** Years of occurrence given in brackets.

TABLE - 2
FREQUENCY OF ANNUAL R/F IN THE DISTRICT
(DATA 1951 - 1996)
UDHAMPUR

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS
1001 - 1100	2	1901 - 2000	0
1101 - 1200	0	2001 - 2100	1
1201 - 1300	1	2101 - 2200	1
1301 - 1400	0	2201 - 2300	2
1401 - 1500	0	2301 - 2400	0
1501 - 1600	2	2401 - 2500	0
1601 - 1700	1	2501 - 2600	1
1701 - 1800	2	2601 - 2700	0
1801 - 1900	0	2701 - 2800	1

(Data available for 14 years)



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