



Twenty-third Session of South Asian Climate Outlook Forum (SASCOF-23) and Climate Services User Forum (CSUF)

**26-29 September 2022
(Held online due to CoViD-19 pandemic)**

SASCOF-23 Outlook for Seasonal Rainfall and Temperature over South Asia during October to December 2022

Summary

Below-normal rainfall is likely during October – December (OND) season 2022 over the extreme southern parts of the South Asia including the islands where climatologically we receive good amount of rainfall during the season. Below normal rainfall is also likely over the northwestern parts of South Asia as well as extreme eastern parts of South Asia which normally receive very low rainfall during OND season. Above normal rainfall is likely over most parts of west, central and north-east regions and remaining area of southern parts of South Asia. Remaining part of the region is likely to experience normal or climatological probability for the seasonal rainfall.

During the season, normal to above normal maximum temperatures are likely over northwest, northeast parts of South Asia including foothills of Himalaya. The maximum temperature is likely to be below normal over the west, central and southern parts of South Asia. The minimum temperature is likely to be above normal over most part of the region except parts of west, northwest and southern parts of South Asia.

This consensus climate outlook for the 2022 OND season over South Asia has been developed through an expert assessment of the prevailing global climate conditions influencing the South Asian climate and seasonal forecasts from different climate models around the world. Currently La Niña conditions are prevailing over equatorial Pacific region and negative Indian Ocean Dipole (IOD) conditions are prevailing over the Indian Ocean. These parameters are known to influence the climate variability over South Asia. Latest forecasts from many climate models indicate that La Niña conditions are likely to continue up to the end of year and the negative IOD conditions are likely to weaken by the end of year. Careful consideration is also given to other regional and global factors as well as the intra seasonal variability of the region that can affect the rainfall and temperature patterns over the region. For more information and further updates on the seasonal climate outlook on national scale, the respective National Meteorological and Hydrological Services (NMHSs) may be consulted.

Introduction:

The southern parts of the South Asia receive significant amounts of rainfall during the October to December (OND) season, which is critical for agricultural operations. The re-establishment of northeasterly trade-wind regime over South Asia associated with the southward movement of the Inter-Tropical Convergence Zone (ITCZ) ushers-in the Northeast monsoon, bringing much needed rainfall to the southern parts of India, Sri Lanka and Maldives. In Sri Lanka, the October to November period is known as second Inter Monsoon (SIM) season. It has been recognized that there is moderate seasonal predictability for the Northeast monsoon circulation over the region as the seasonal variability is strongly influenced by the slowly varying boundary forcing like sea surface temperatures. However, the predictability is limited to some extent due to the strong day to day atmospheric variability caused by the passage of the synoptic scale weather systems such as easterly waves, lows, depressions, cyclones etc. The seasonal predictability of the northeast monsoon over the region is also influenced by the Madden Julian Oscillation (MJO), which represent the major global scale intra-seasonal variability pattern.

The climate outlook for the 2022 October to December season was finalized during the twenty-third session of the South Asian Climate Outlook Forum (SASCOF-23) held during 26-29 September 2022 via video conferencing in the backdrop of the Covid-19 pandemic prevailing in the world. The session was attended by experts representing the National Meteorological and Hydrological Services (NMHSs) of all the nine South Asian countries as well as those representing several global and regional climate agencies including World Meteorological Organization (WMO), WMO Regional Climate Centre (RCC) Pune, Indian Institute of Tropical Meteorology (IITM), Met Office (UKMO), International Research Institute for Climate and Society (IRI), Regional Integrated Multi-hazard Early-warning System (RIMES), Japan Meteorological Agency (JMA) etc. The online forum deliberated on various observed and emerging climate forcing that are known to influence the climate variability of the region such as the El Niño/Southern Oscillation (ENSO) conditions over the equatorial Pacific, Indian Ocean Dipole (IOD) conditions over the Indian Ocean etc. The key features of these climate forcing are briefly discussed below.

Conditions over the Pacific Ocean

The ENSO is one of the global scale climate forcings that have significant influence on the year-to-year variability of the northeast monsoon rainfall as well as the surface temperatures over South Asia. The La Niña conditions that developed in September 2020 continue to prevail through to September 2022. Currently, the La Niña conditions are prevailing over the Pacific. Latest forecasts from many climate models indicating the continuation of La Niña conditions during the upcoming season.

Conditions over the Indian Ocean

In addition to ENSO conditions over the Pacific, other factors such as Indian Ocean sea surface temperatures have some influence on the climate variability of the region. At present the negative IOD conditions are prevailing since June 2022 over the Indian Ocean. Recent forecasts from majority of the coupled models suggest that the negative IOD conditions are likely to continue during October to December season.

SASCOF Outlook for the 2022 October to December Season Rainfall over South Asia:

A consensus outlook for October to December season rainfall over South Asia has been prepared based on the expert assessment of prevailing large-scale global climate indicators mentioned above and experimental as well as operational long-range forecasts based on statistical and dynamical models generated by various operational and research centers of the world.

There is unanimity among the experts that the La Niña conditions in the equatorial Pacific Ocean is likely to continue during the upcoming season and the negative Indian Ocean Dipole conditions over Indian Ocean are likely to continue during October to December season. The relative impact of all these parameters needs to be considered to determine the expected state of the climate over the region during the season.

The outlook for the 2022 October to December season rainfall over South Asia is shown in **Fig.1a**. The figure illustrates the most likely tercile category¹ as well as its probability for each of the 1° latitude x 1° longitude spatial grid boxes over the

region. The dotted area showed in the map climatologically receives very low rainfall and experience dry weather during OND season. The box-wise tercile probabilities were derived using an objective approach from an initial set of gridded forecasts from multiple GCMs and consolidated through a consensus building discussion among climate experts.

The outlook suggests that during the 2022 October to December (OND) season, below-normal rainfall is likely over extreme southern parts of the South Asia including the islands where climatologically receive good amount of rainfall during the season. Below normal rainfall is also likely over the northwestern and northern parts of South Asia as well as extreme eastern parts of South Asia which normally receive very low rainfall during OND season. Above normal rainfall is likely over most parts of west, central and north-east regions and a few regions of southern parts of South Asia. Remaining part of the region is likely to experience normal or climatological probability for the seasonal rainfall during October – December 2022. As the rainfall during the October to December season depicts strong intra-seasonal variability, it is advised to watch the extended range forecasts along with updated seasonal forecasts for better decision making. The extended range forecasts for rainfall, temperature, cyclone genesis, MJO etc. over the region can be obtained from RCC, Pune website (<http://rcc.imdpune.gov.in/exrange.html>). These forecasts are updated every week.

The consensus outlook for the 2022 October to December maximum and minimum temperature over South Asia is shown in **Fig.1b and 1c**. During the season, normal to above normal maximum temperatures are likely over northwest, north, northeast parts of South Asia including foothills of Himalaya. The maximum temperature is likely to be below normal over the west, central and southern parts of South Asia. The minimum temperature is likely to be above normal over most part of the region except over parts of west, northwest and southern parts of South Asia.

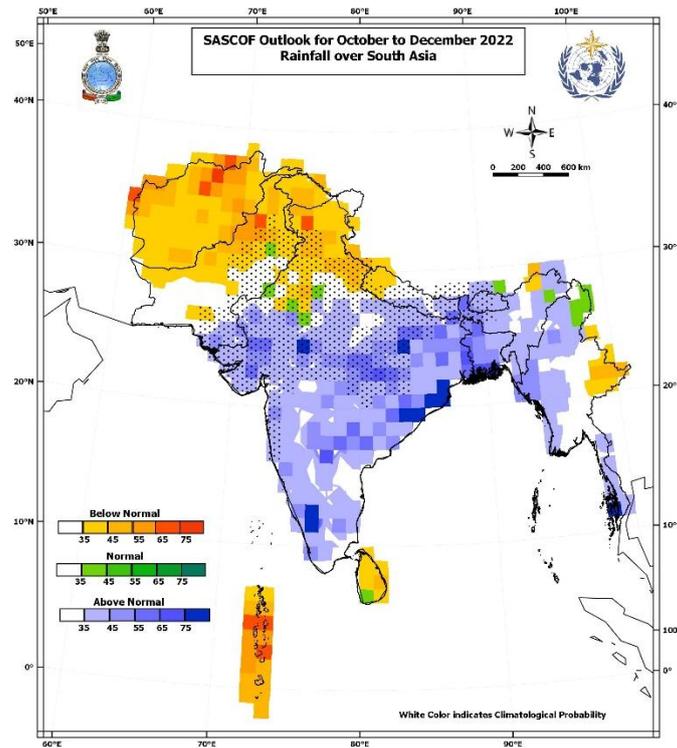


Fig.1a. Outlook for 2022 October to December season Rainfall over South Asia. The dotted area showed in the map climatologically receives very low rainfall and experience dry weather during OND season.

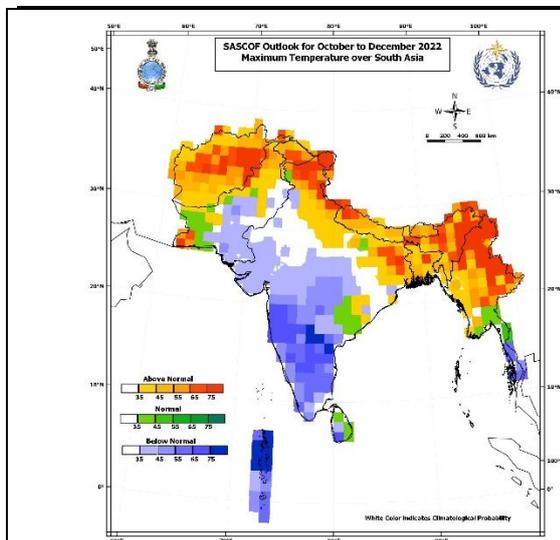


Fig.1b. Outlook for October to December season 2022 maximum temperature over South Asia.

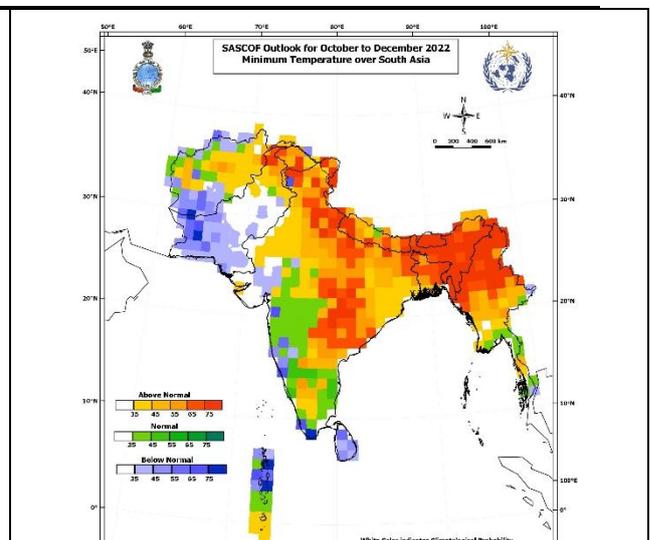
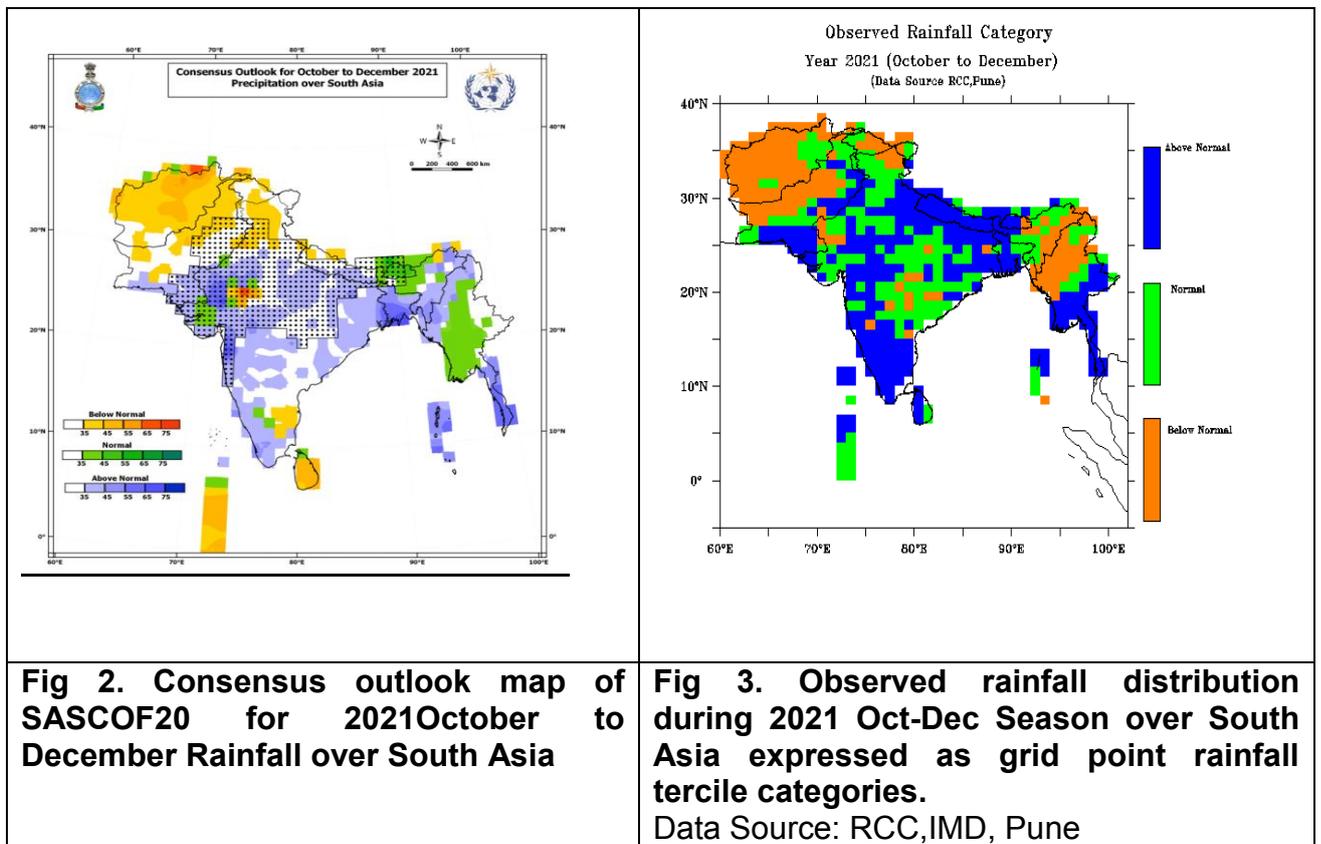


Fig.1c. Outlook for October to December season 2022 minimum temperature over South Asia.

Tercile categories have equal climatological probabilities, of 33.33% each.

Verification of consensus outlook for 2021 October to December season

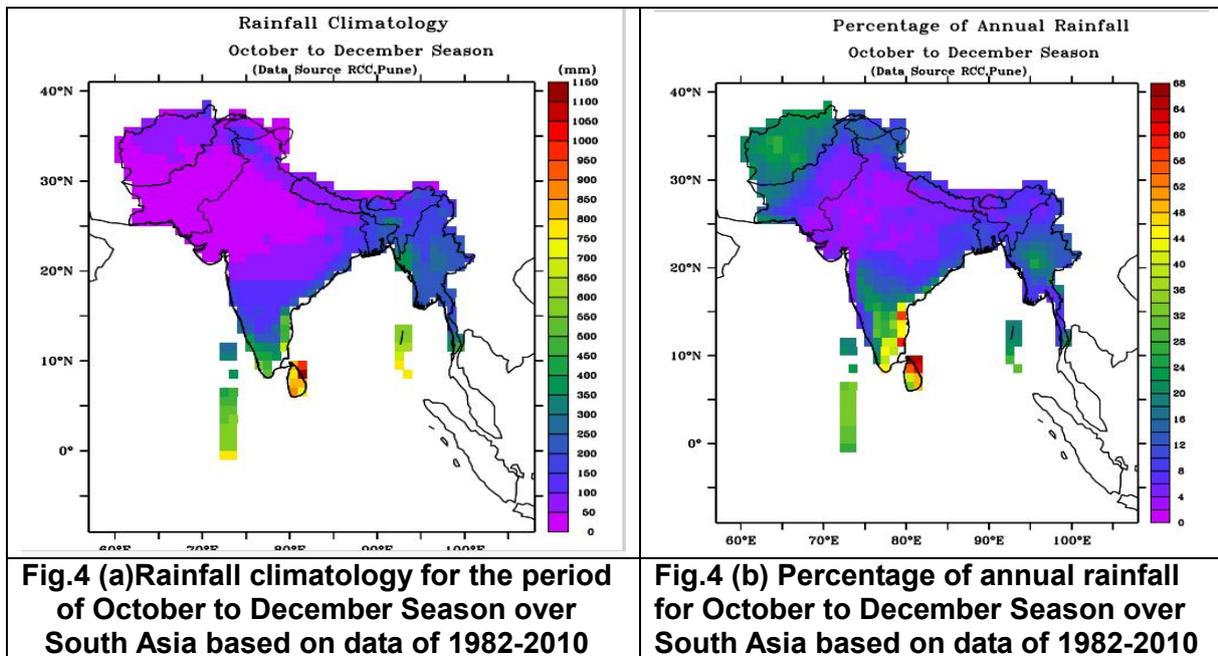


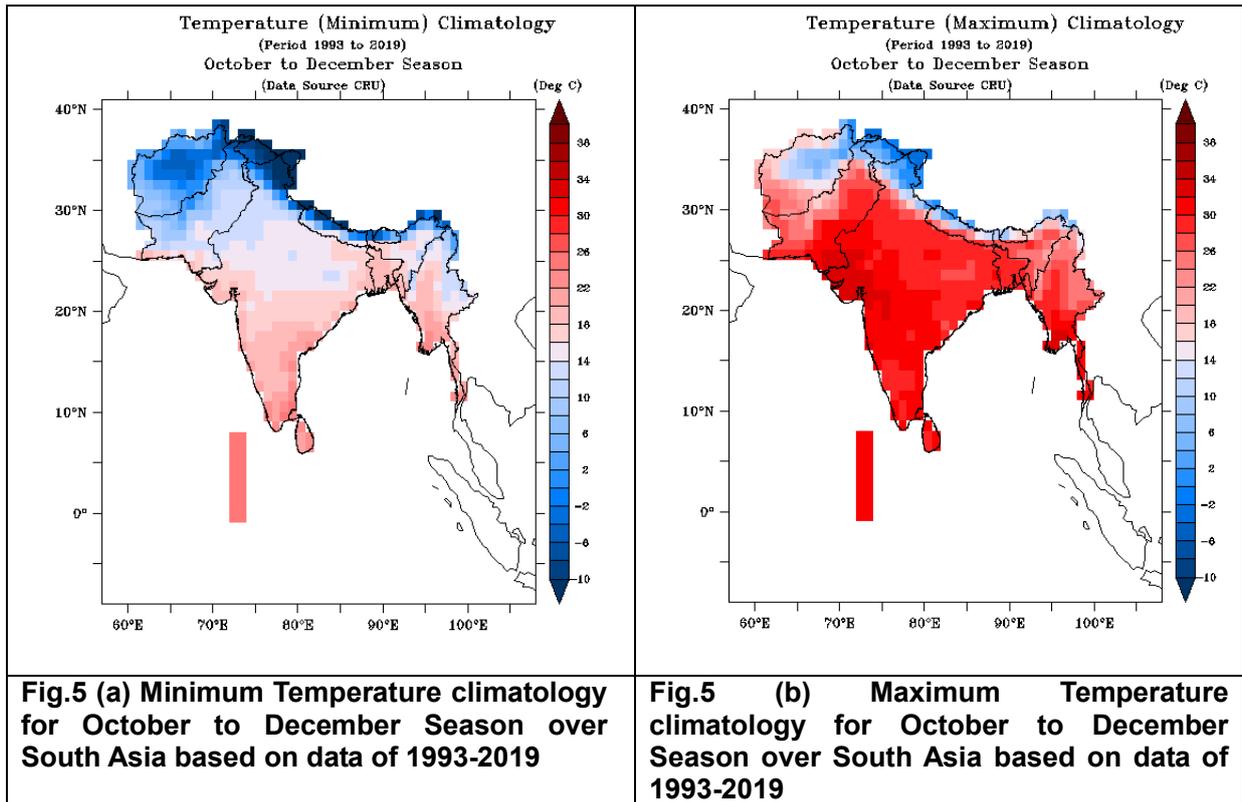
The consensus forecast outlook map (Fig.2) for the 2021 October to December season suggested below-normal rainfall over the southern parts of the South Asia including the islands as well as over the northwestern and northern parts of South Asia including some areas along the foot hills of Himalayas. Also. The consensus forecast suggested above normal rainfall over most parts of west, central and north-east regions of South Asia. Normal rainfall was forecasted over the remaining parts of the region.

Fig. 3 shows the forecast rainfall distribution during the 2021 October to December Season expressed in terms of tercile categories. It can be seen that below normal rainfall was received over most of the areas of north, north-west regions and parts of northeast regions of South Asia. Above normal rainfall was received over most areas of central, south and along the foothills Himalayas. The remaining areas of the region received normal rainfall.

From the above Figures 2 & 3, for the parts of the region where a climatologically good amount of rainfall is received during the season, both the forecast and realized rainfall categories were same. However, the model forecast was not correct over southern part of the region including islands. However, the below-normal rainfall forecast over the north and northwestern parts of the region matched very well with the observed category. The SASCOF outlook for the 2021 October to December season rainfall was accurate in most areas, except the islands and parts of northeast regions of South Asia.

The long-term historical patterns of the rainfall over South Asia during October to December Season (Fig.4 a & b), characterized by remarkable spatial variability, provide the general reference points at the respective locations for the rainfall anomalies indicated in the outlook.





The long-term historical patterns of the Temperature (Minimum and Maximum) over South Asia during October to December (Fig.5 a & b), characterized by large spatial variability, provide the general reference points at the respective locations for the temperature anomalies indicated in the outlook.