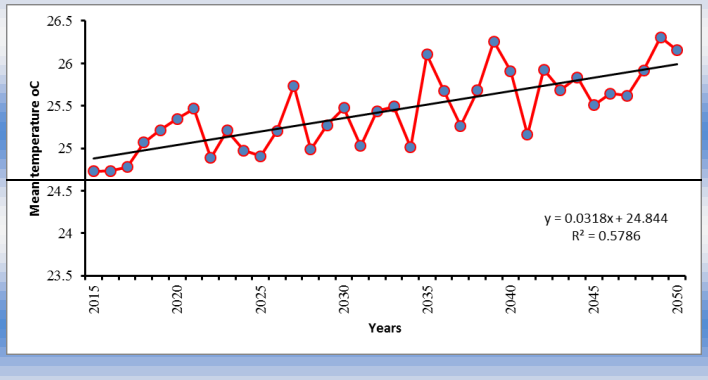
# Bulletin of IMSP (BIMSP)

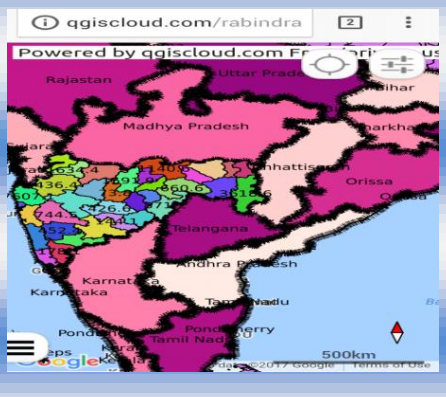
**JUNE - SEPTEMBER 2019**

**Vol. 18, No. 6-9**

**SPECIAL ISSUE**




**Simulated Mean Temperature** based on CORDEX data for the period 2015-2050 over Maharashtra, India




**Malaria Information Infrastructure Mapping** in Maharashtra, India on Mobile client in *m-cloud*

**IMSP Special Lectures** by **Dr. K. J. Ramesh** and **Prof. Sulochana Gadgil**, at IITM Pune

# Indian Meteorological Society

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The Indian Meteorological Society was established in 1956 and was registered on 26 May 1972 under the societies Registration act of 1860 as amended by Punjab Amendment Act 1957 applicable to Delhi. Registration No. of the society is 5403. The society's headquarter is located at Delhi and its local chapters are functional at various places.

The Society is a non-profit making organization and none of its income or assets accrues to the benefit of its members.

**Objective of the Society**

1. Advancement of Meteorological and allied sciences in all their aspects
2. Dissemination of the knowledge of such sciences both among the scientific workers and among the public and
3. Promotion of application of Meteorology and allied sciences to various constructive human activities

Any person who is interested in aims of the society is eligible to become a member.
The annual subscription of membership is Rs. 500/- for scientists from India +Admission fee, Rs. 50/-.
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**"Bulletin of IMSP"** is generally published monthly, or for certain duration for Special issues. Correspondence and contributions to the bulletin may be sent to **pune_ims@rediffmail.com**. The manuscript should be typed at 1.15 space using Times New Roman font size 12. The author's name should be typed on the line below the title, the affiliation and email ID should follow on next line.

**The Editor and the society are not responsible for the views expressed by any author in his contributions published in Bulletin of IMSP.**

# Bulletin of IMSP

## June - September 2019, Vol. 18, No. 6 - 9

**Contents :**

# Scientists evaluate the ups and downs in the monsoon 2019 rainfall

**Abhay S.D. Rajput** [1,2]
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Pune: The Indian summer monsoon is the lifeline of the agriculture-based Indian economy and society. The rainfall in monsoon season during June to September plays a deciding role and any fluctuations in rainfall can cost us dearly affecting agriculture, water resources management, livelihood of farmers and related professions.

The Indian summer monsoon of 2019 started with a massive deficit of about 33% of the mean of the all-India rainfall in the month of June. There were speculations that like the summer monsoon of 2014, it is going to be another drought in 2019. But the reverse happened with heavy rainfall during July and August even leading to severe flooding at several places in the country.

So what happened to these contrasting levels of rainfall during June and July-August of 2019 translating a speculated drought into above-normal rainfall?

"We found that the deficit rainfall in June 2019, like that in June 2014, can be attributed to the El Niño. But the weakening of El Niño in July and the favourable Equatorial Indian Ocean Oscillation (EQUINOO) led to the enhancement of the monsoon rainfall from July onward", said Prof. Sulochana Gadgil, a renowned expert on Monsoon and a professor at the Centre for Atmospheric and Oceanic Sciences (CAOS), Indian Institute of Science, Bengaluru.

Prof. Gadgil was delivering a special lecture on "How and Why of the Performance of the Summer Monsoon of 2019?" organised by the Indian Meteorological Society Pune Chapter (IMSP) at the Indian Institute of Tropical Meteorology (IITM), Pune on 23rd September 2019.

EQUINOO is a sea-saw in the convection between the eastern and western parts of the equatorial Indian Ocean. As first pointed out by Prof. Gadgil and her team in 2003, like El Niño, EQUINOO plays an equally important role in affecting monsoon rainfall over India.

Weak El Niño and a positive EQUINOO are favourable for monsoon rainfall over India. "We made an educated guess on 14 August 2019 that EQUINOO would strengthen in the second part (August-September) of the monsoon season in 2019 leading to a favourable situation for more rainfall in August-September that could yield above-normal rainfall for the season as a whole," said Prof. Gadgil.

In 2003 and 2008, positive EQUINOO did not sustain in August and September, but in 2019, it did sustain during August and September and the above average rainfall in July-August was due to strong EQUINOO. "The educated guess made earlier has been validated by the real time observations of monsoon 2019 rainfall", she added.

"EQUINOO and its role in monsoon have remained largely unexplored in the world. We suggest that EQUINOO's role and its evolution needs to be further investigated for better understanding its role in Indian summer monsoon rainfall and for improving monsoon prediction over India", said Prof. Gadgil. She further suggested that concerted efforts by oceanographers, meteorologists in observational and

modelling studies to understand the equatorial dynamics over the Indian Ocean are needed for improving prediction skill of EQUINOO by dynamical models.

The lecture was based on a recent *Current Science* paper by Prof. Gadgil along with two co-authors: Dr. P.A. Francis from Indian National Centre for Ocean Information Services, Hyderabad and Prof.. P.N. Vinayachandran from the Centre for Atmospheric and Oceanic Sciences at Indian Institute of Science, Bengaluru.

Photo: Prof. Sulochana Gadgil

# Computer Glossary Crossword


## Manoj Kumar Tandon[1, 2, 3, 4]

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[2]Visiting Faculty, Savitribai Phule Pune University, Pune

[3]7/12, White House Society, Yerwada, Pune.

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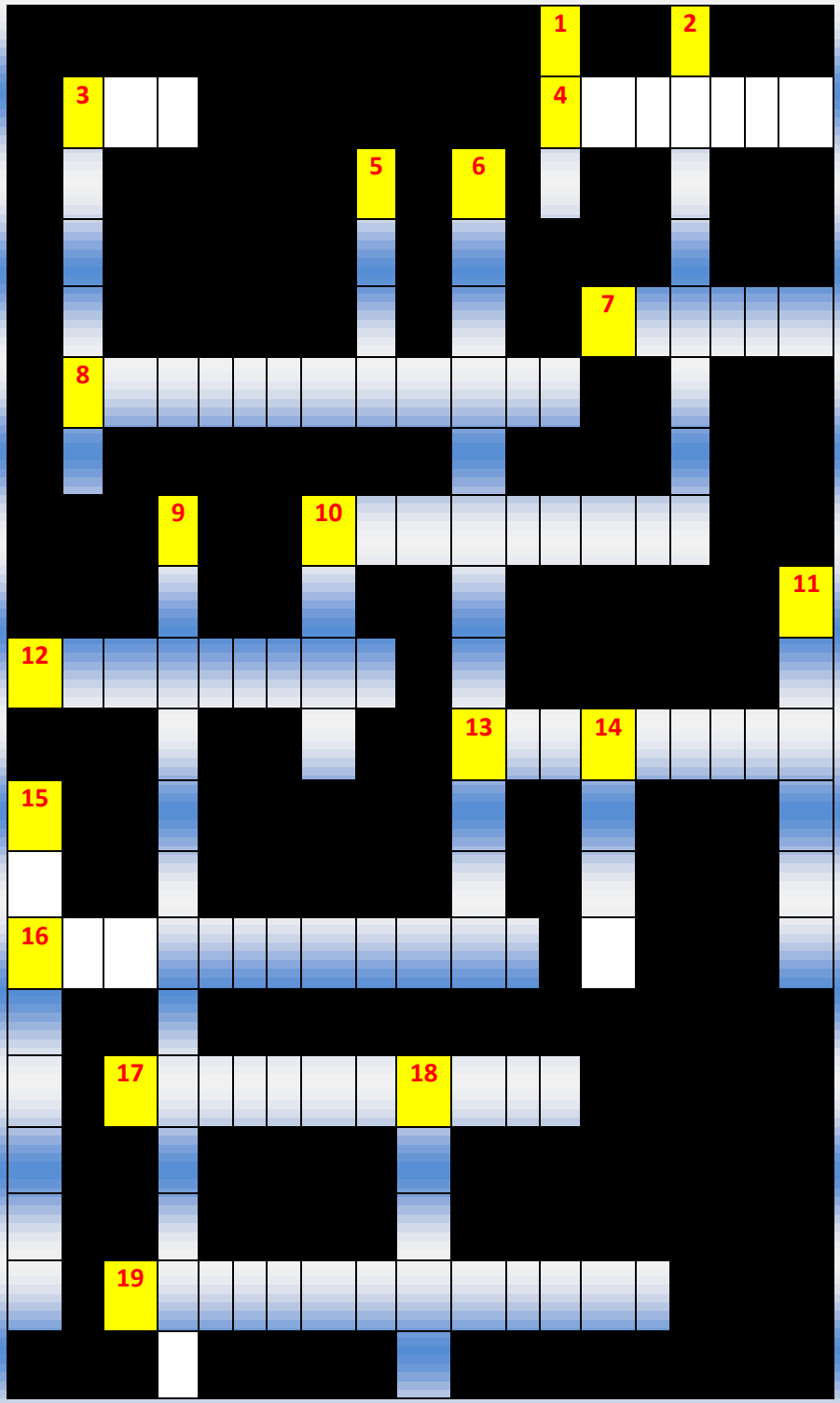



**Alongside Crossword can give a collection of words, which are frequently used in Computer Sciences and form a part of the Computer Glossary. Such words can be formed by inserting appropriate English alphabets in the white/yellow vacant boxes of the crossword (both horizontally across and vertically down). For its solution, Clues Across and Clues Down have been given in Page No. 7 and 8 respectively.**

**Please try to get these 21 (10 Across and 11 Down) Computer words using the given Clues.**

**The complete solution (solved Computer Glossary Crossword) has been given on Page-9, for your kind information & use.**

## Clues Across

**3** Random Access Memory.

**4** Setting that is automatic unless changed by the user.

**7** Electronic Mail.

**8** Printers and Monitors (Two Joined Words).

**10** Area on screen where user interacts with the software application.

**12** A small window with options for completing an action. **(Two Joined Words).**

**13** Miniature version of the documents.

**16** Allows more than one application to run at a time.

**17** Keyboard, Mouse, Disk Drive, USB Drive **(Two Joined Words).**

**19** A tab added to the Ribbon for certain activities **(Two Joined Words).**

## Clues Down

**1** Format widely used because all document formatting is preserved.

**2** Expands the window to fill the screen.

**3** Related commands that are divided into tabs.

**5** Collection of related data stored on a hard disk.

**6** Displays a menu of commands for opening, saving and printing (Two joined Words).

**9** Indicates the file type and is used by the application to recognize files (Two Joined Words).

**10** Little pictures that represent programs on the desktop.

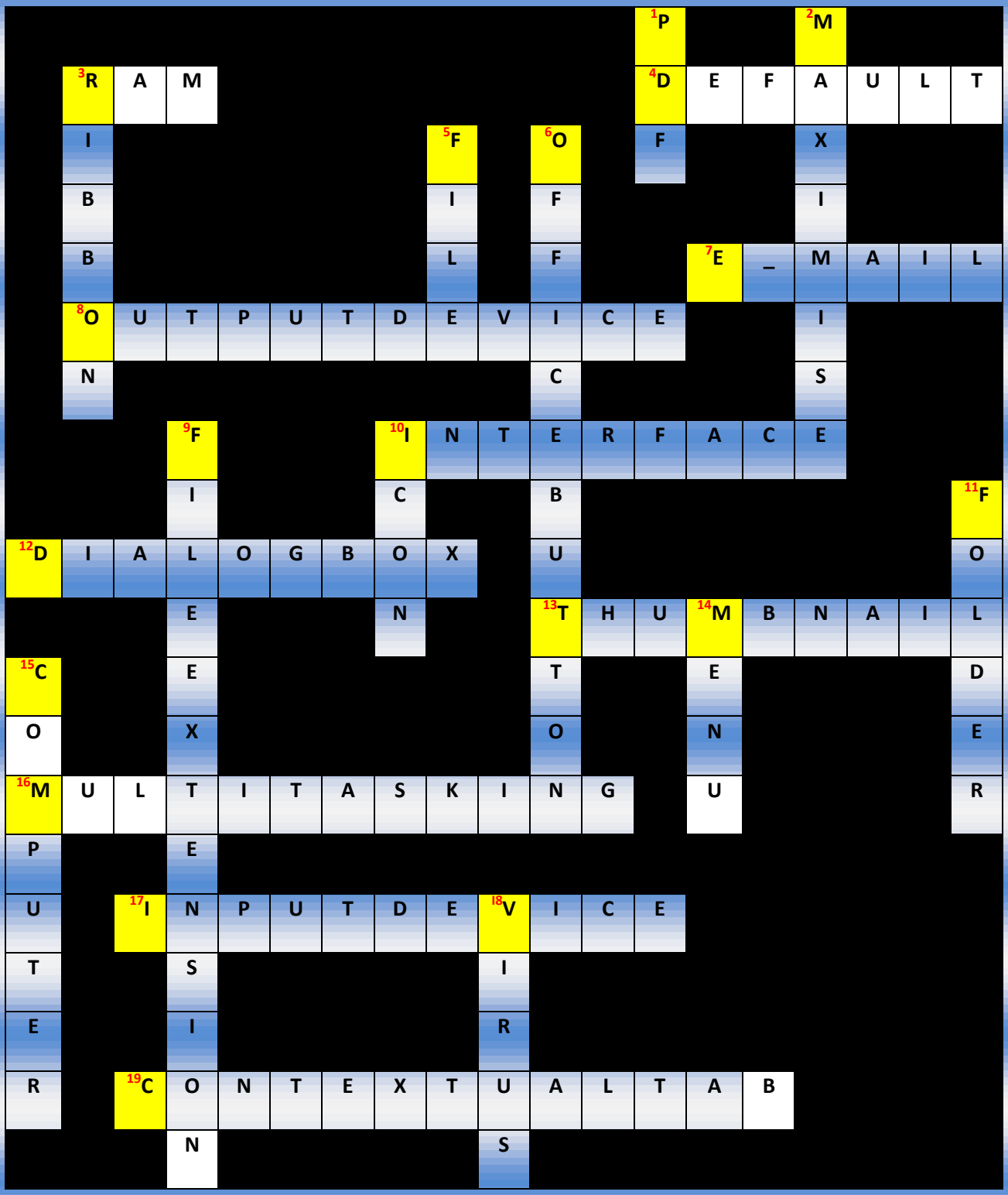
**11** Used to organize files.

**14** A list of commands.

**15** Follows a program; designed to compute.

**18** Malicious code that appears like a useful program.

# Solved Computer Glossary Crossword



# Some important achievements of the "Monsoon Mission"

**Compiled by**

**Somnath Mahapatra** [1,2.3,4]

[1]Scientist – E, Monsoon Mission Phase –II, Indian Institute of Tropical Meteorology, Pune
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[3]Secretary, IMS Pune Chapter (IMSP)
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Agricultural productivity and economy of our country largely depends on the performance of Indian monsoon rainfall, hence Indian Monsoon is sometimes referred to as another "Finance Minister" of our country. Therefore, prediction of total quantum of Indian summer monsoon rainfall (ISMR) during the months of June to September (also called the "seasonal rainfall", which produces about 80% annual rainfall over the country), its intra-seasonal variability & inter-annual variability and knowledge of extreme rainfall conditions are very much useful for planning and management of agriculture, water resources and disaster management, leading to great benefit to the society and citizens of the country.

In the recent decade, weather & climate predictions by dynamical numerical models have considerably improved in different time scales, viz., short range forecast (up to 3 to 8 days in advance) to medium range forecast (up to 2 weeks in advance), extended range prediction (up to 4 weeks in advance) and long range forecast (LRF) or the seasonal prediction (for June –September ISMR). ISMR has a global teleconnection with El Nino/Southern Oscillation (ENSO) Sea Surface Temperature (SST) over the tropical eastern Pacific Ocean. Most of the state-of-the-art global coupled models have good prediction skill of ENSO SST with six months lead time. The hindcast skill of seasonal mean rainfall, one season in advance, over the central Pacific is also very good. However, a decade ago (till 2010), no significant breakthrough had taken place in improving the prediction skill of the ISMR. Historically, statistical models had been used for operational long range forecasts for the Indian summer monsoon rainfall over the years. But, improvement in prediction skill was not appreciable in operational forecasts, in spite of better understanding of monsoon variability and its teleconnection mechanisms. Moreover, statistical models had constraints in predicting monsoon rainfall in higher spatial and temporal resolutions. In recent times, with the dynamical models, several new approaches (high resolution, improved physical parameterization schemes, super parameterizations, data assimilation, etc.) have shown that the variability in tropics can be reasonably resolved, thereby creating optimism for improving the monsoon prediction. Although many centres in the world were using dynamical modelling frameworks to predict seasonal mean climate routinely, in India such a framework was not in place before 2012. Keeping in view the importance of a dynamical prediction framework, the **Earth System Science Organization (ESSO) of the Ministry of Earth Sciences (MoES) launched an ambitious project named "Monsoon Mission" in 2012, to develop a dynamical prediction system (modelling framework) for improving monsoon prediction skill in different time scales, over the Indian region.**

Details of this Mission can be found in the **"Science and Implementation Plan of the Monsoon Mission**", available in the following web-link of the Monsoon Mission website:

**https://www.tropmet.res.in/monsoon/assets/files/Monson_Mission_Science_Plan.pdf .**

## ❖ Objectives and achievements of the Monsoon Mission:

The "Monsoon Mission" project was launched by ESSO, Ministry of Earth Sciences (**MoES**), Government of India in 2012, with **focus on two major objectives: (1) To build a working partnership between the Academic and Research & Development Organizations, both national and international, and the MoES to improve the monsoon forecast skill over the country ; and (2) To setup a state of the art dynamical modelling framework for improving prediction skill of (a) Seasonal and Extended range predictions and (b) Short and Medium range (up to two weeks) prediction.**

Thus, the main target was to develop dynamical modelling framework on different time scales with improved skill for predicting Indian monsoon weather and climate, through combined efforts. The Indian Institute of Tropical Meteorology (IITM), Pune has been coordinating the Monsoon Mission program since 2012. Four MoES institutes of ESSO (IITM, NCMRWF, IMD and INCOIS) have partnered actively in this important and ambitious program to realize the above objectives. The ocean-atmosphere coupled dynamical model "Climate Forecast System, Version-2" (CFSv2, adopted from NCEP, USA) was chosen as the base model for extended range (predictions up to 4 weeks in advance) to seasonal (for the SW monsoon season of June to September) prediction of monsoon. IITM developed a seasonal prediction system of very high horizontal resolution (of ~38 km) with considerably good prediction skill for predicting Indian summer Monsoon rainfall (ISMR), as well as an extended range prediction system (up to 4 weeks in advance) of very high accuracy. Due to these activities, there has been significant improvement in prediction skill of the dynamical models (which was very low in the last decade). IITM Scientists have carried out developmental activities in the direction of improving convective parameterization, cloud microphysics, parameterization of land surface processes, etc. IITM also worked on improving short range prediction system (up to 8 days in advance) using Global Forecast system (GFS, the atmospheric model of CFSv2) of very high resolution (of ~12 km) in association with NCMRWF and IMD. Infrastructure required for these developmental activities was made available at IITM and NCMRWF as part of Monsoon Mission by procuring and installing High performance computing (HPC) facility. IITM transferred these modelling systems to IMD for operational prediction (Long and extended range forecasts). NCMRWF worked on improving short to medium range forecasts using Unified Model (UM) of UK Met. Office (UKMO) for short to medium range weather forecast (prediction up to 10 days in advance) and contributed for implementation & operationalization of the atmospheric data assimilation system for both UM and GFS models. Ocean data assimilation system was set up at INCOIS (in close association with IITM) and was involved in providing initial conditions of ocean data for different forecasts using GODAS.

For building a working partnership between the Academic and R&D Organizations and the MoES organizations (IITM, IMD, NCMRWF & INCOIS), several national and international projects were funded through Monsoon Mission.The above targets set through the above objectives have been achieved successfully during the first phase of Monsoon Mission program (2012-2017), in close association of IITM, NCMRWF, IMD and INCOIS. The details are available in the recent paper by Rao et. al. (2019), published in the Bulletin of American Meteorological Society (BAMS).

After the successful completion of Phase-I (2012-2017), the Ministry of Earth Sciences (MoES) launched the Monsoon Mission Phase-II (2017-2020) in September 2017, with emphasis on predicting extremes and development of climatic applications based on monsoon forecasts, especially in the field of agriculture and hydrology, while continuing model development activities.

IITM initiated the work for climatic applications in agriculture and hydrology in collaboration with IMD, ICRISAT, etc. The cyclone prediction by IMD has been excellent in recent times with a very large lead time of more than one week. This enabled central and state governments as well as NDRF/SDRF teams and armed forces to get sufficient preparation time for their operations like evacuation of human and other living beings and other important measures for considerable decrease in loss of life due to cyclone impacts. Also, in association with IITM, IMD has started giving prediction of heat waves, cold waves and other severe conditions at a very high skill. In this regard, IITM has been supporting IMD in all aspects.

Through Monsoon Mission, a very high resolution (highest resolution of ~12km) short range forecast system (Global Ensemble Prediction System, EPS, with 21 ensemble members for short range forecast system based on GEFS T1534) was developed at IITM (in association with IMD & NCMRWF) in June 2018 and the system was transferred to IMD for its operational use. Subsequently the latest version 14 of GEFS has been implemented for operational forecast in IMD. The forecast based on GEFS T1534 and GFS T1534 is being continued by IMD operationally. In addition, the probabilistic forecast for all the river basins of India, have been developed at IITM and shared with the IMD, Hydrology division, New Delhi. It has been utilized by IMD's Flood Monitoring Office (FMOs) at different places.

There have been significant works in Data Assimilation system using WCDA (Weakly Coupled Data Assimilation) CFS-LETKF (Local Ensemble Transform Kalman Filter) at IITM (in association with INCOIS and University of Maryland, USA). IITM scientists successfully assimilated the high resolution satellite derived SST data in CFS LETKF WCDA system, which was installed on HPC Pratyush. Strongly coupled LETKF Ocean atmospheric coupled data assimilation system for CFSv2 has been implemented on HPC Aaditya.

To address an important objective of Monsoon Mission Phase-II to **develop a prediction system for extreme weather conditions**, there was development of a **dynamical prediction system for thunderstorms forecast at IITM Pune** (in association with IMD). For this, a thunderstorm/lightning

modelling team was identified with objectives to develop "a system for thunderstorm/ lightning prediction" using high resolution regional climate model (such as WRF) and Improvement of extreme monsoon forecast using coupled GCM and dynamical downscaling (under "Monsoon Mission – Phase II" project of MoES) at IITM Pune.

- During the last few years, important achievements made under the Monsoon Mission include:

- Development of a dynamical seasonal prediction system (MMCFS) of very high resolution (of ~38 km) with considerably good prediction skill for predicting Indian summer Monsoon rainfall (ISMR), using a modified version of CFSv2 T382 model by IITM. The model was transferred to IMD for operational forecasts to the nation from 2017 onwards. At present, this model is referred as "Monsoon Mission CFS" (MMCFS) Model.
- Development of dynamical extended range prediction system (up to 4 weeks in advance) of very high accuracy by IITM and it was made operational by IMD since 2017.
- Significant improvement in prediction skill of the dynamical models (which was very low in the last decade) through model developmental activities.
- Development of a very high resolution (~12 km) Global Ensemble Prediction System (EPS) with 21 ensemble members for short range forecast system based on GEFS (T1534), put in place by IITM and handed over to IMD for operational implementation since June 2018.
- Development of Data Assimilation systems, using WCDA (Weakly Coupled Data Assimilation) CFS-LETKF (Local Ensemble Transform Kalman Filter) and Strongly coupled LETKF Ocean atmospheric coupled data assimilation system for CFSv2.
- Development of 1 km thunderstorm/lightening prediction system.
- The cyclone prediction by IMD has been excellent in recent times with a very long lead time.
- In association with IITM and NCMRWF, IMD has started giving prediction of heat waves, cold waves and other severe weather conditions at a very high skill.
- Work for climatic applications in agriculture and hydrology is in progress by IITM, in collaboration with IMD, ICRISAT, etc.
- All information and predictions are given for the whole country and thus, this Monsoon Mission program has shown its National behavior in true sense.
- A large number of research papers (>200) were published by scientists (working in this project) in high impact journals.
- The achievements have been in the lines of the targets set for the Mission, still more improvements are necessary for which scientists are working continuously.

**It may please be noted that there are many more achievements of this Mission, whose details are available in the published papers and may be compiled in due course.**

Monsoon Mission effectively worked to build a working partnership between the Academic and R&D Organizations, both national and international and the MoES organizations, through funding of national and international projects, to improve the monsoon forecast skill over the country. Monsoon Mission funded several National (Indian) and International (foreign) projects for Research & Development on

Indian Monsoon and related issues. The administration and management for these projects were coordinated by IITM, with Director IITM as the Mission Director, who has been well supported by Associate Mission Director & Project Directors of Monsoon Mission and a Monsoon Mission Directorate (MMD). MMD is comprised of a Project Manager and few staff to coordinate & implement administrative, financial & other aspects of the Monsoon Mission projects. For funding appropriate projects, Monsoon Mission uses to invite project proposals globally (both national & international) and the proposals are reviewed by "Scientific Review & Monitoring Committee" (SRMC) of the Monsoon Mission periodically during SRMC meetings. SRMC recommends the appropriate projects (in the line of main objectives of the Monsoon Mission) to the "Scientific Steering Committee" (SSC) of the Monsoon Mission for approval & sanction of the Ministry (MoES). MMD uses to organize the SRMC and SSC meetings and take necessary actions after approval & sanction of the particular projects for funding through Monsoon Mission.

Monsoon Mission also helped for infrastructural & computational development (like procurement of High performance Computers at MoES organizations) and capacity building. Through Monsoon Mission, there have been several high level trainings for scientists & young researchers, discussion meetings, brainstorming meetings, etc. Some young scientists of MoES organizations (IITM, NCMRWF & INCOIS) were deputed abroad to work with International Project Investigators (PIs) of International Projects of Monsoon Mission. Some young researchers completed their Ph. D. works, in association with National projects of the Monsoon Mission. Overall, Monsoon Mission elevated the status of Indian science, particularly in the field of Atmospheric & Ocean sciences, in the International forum and we can be proud of its achievements.

**Some Important References:**

"**Science and Implementation Plan of the Monsoon Mission", Ministry of Earth Sciences (MoES), Government of India, (Compiled by Dr. Suryachandra A. Rao, Dr. M. Rajeevan, Mr. S. Mahapatra and Prof. B. N. Goswami), July 2014. Available at the following web-link of Monsoon Mission website: https://www.tropmet.res.in/monsoon/assets/files/Monson_Mission_Science_Plan.pdf**

**Rao, S.A.,** B.N. Goswami, A.K. Sahai, E.N. Rajagopal, P. Mukhopadhyay, M. Rajeevan, S. Nayak, L.S. Rathore, S.S. Shenoi, K.J. Ramesh, R. Nanjundiah, M. Ravichandran, A.K. Mitra, D.S. Pai, S.K. Bhowmik, A. Hazra, S. Mahapatra, S.K. Saha, H.S. Chaudhari, S. Joseph, S. Pentakota, S. Pokhrel, P.A. Pillai, R. Chattopadhyay, M. Deshpande, R.P. Krishna, R. Siddharth, V.S. Prasad, S. Abhilash, S. Panickal, R. Krishnan, S. Kumar, D.A. Ramu, S.S. Reddy, A. Arora, T. Goswami, A. Rai, A. Srivastava, M. Pradhan, S. Tirkey, M. Ganai, R. Mandal, A. Dey, S. Sarkar, S. Malviya, A. Dhakate, K. Salunke, and P. Maini, **2019**: **"Monsoon Mission: A targeted activity to improve monsoon prediction across scales", Bulletin of the American Meteorological Society (BAMS)**, https://doi.org/10.1175/BAMSD170330.1 December **2019,** p. 2509-2532, [The paper was **published online in September 2019**, https://doi.org/10.1175_BAMS-D-17-0330.1 ]

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# Need of SDI Model *(m-cloud)* for Malaria Information Infrastructure Mapping in India

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## Introduction

Malaria is a major global health problem and part of Vector Borne Diseases (VBD). Worldwide malaria affects 3.5 to 5.0 billion people, with one million deaths annually. The risk of malaria is considered largely due to environmental factors. The multiplicity of health problems affecting the urban population today, resurgence of malaria contribute to higher morbidity and outbreaks. An attempt has been made here to develop & implement prototype based *m-cloud* i.e. Cloud SDI Model for Malaria Information Infrastructure Mapping for Maharashtra. The system architecture of cloud SDI model can work on web browser, mobile and desktop and mobile devices. The proposed *m-cloud* model can easily analyse pattern and trends in occurrence of malaria and also identify the high risk malaria prone districts in the state of Maharashtra.

## Cloud SDI Model

Cloud computing has a supply infrastructure capability, over a web platform to share spatial data, statistics, guidelines, practices, services etc. Cloud SDI offer Geospatial Web Services (GWS) which are well-organized set of actions, self-confined and independent upon state of other services. The system architecture of Cloud SDI Model is categorized into data, application and user layers.

## Geospatial Web Services (GWS) for Cloud SDI Model

GWS help in display, processing requests for geographic information, geospatial data visualization, build applications and plotting in SDI model. The geospatial database development for *m-cloud* is done in Open Source GIS; Quantum GIS Ver 2.14.3 and Map Window GIS Ver 4.8.8.

## Methodology adopted for *'m-cloud'*

Geospatial database provides distribution of spatial & non-spatial data in *m-cloud*. The process model based on Object Oriented Software Engineering (OOSE) by Jacobson's method is shown in Figure 1.

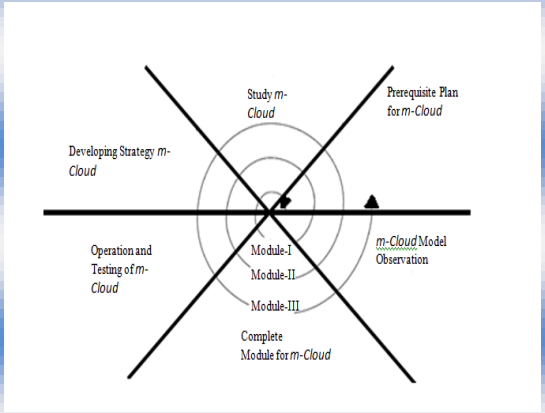


**Figure 1: Spiral** process model for *m-cloud* development.

The model helps in spatial database creation in various steps in a spiral process as shown in Figure 1.The QGIS- Cloud software sets up the database for Malaria Information Infrastructure Mapping, on map of Maharashtra India. The *m-cloud* hasthree key functional phases. Phase I provides geospatial database of Malaria Information application in GIS environment, beneficial to end users and government organizations etc. Phase II defines development of OGC compliant services for WMS, WFS and WCS. Phase III performs the addition and overlay operations in cloud for mobile and other user platforms. The main focus here is on geospatial database creation and geospatial analysis by OS GIS for a comprehensive development of Cloud SDI Model.

**Geospatial Database Creation:**

The creation/designing of spatial digital database is quite tedious. Integrated spatial database design includes many stages of input, of selection of datasets, spatial data and related attributes, authentication of data etc. After geo-referencing, the generated image is ready for extracting and preparation of different thematic maps, example Figure 2.

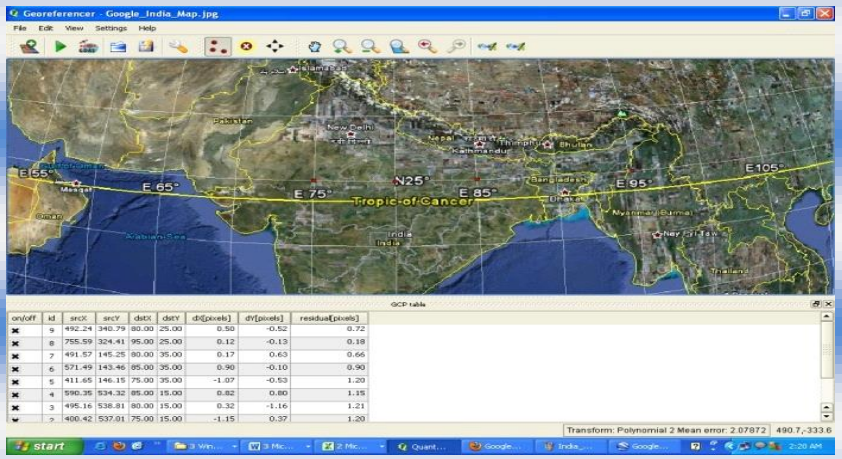


**Figure 2:** Geo-reference Map of India

In the present case study, all the districts of Maharashtra have been selected. The database has been categorized into different layers as per the defined schema. *M-cloud has* contributed enormously in

consolidating the epidemiological process of malaria with examples. The proposed model is available for researchers and decision makers engaged in mitigation and control of malaria.

**Climate Projection**

The yearly projected mean temperature and monsoon rainfall values for 2015 and 2050 were obtained by averaging the monsoon rainfall values of pixel (0.25◦*0.25◦) size over Maharashtra. Linear regression analysis of annual mean temperature carried to asses future changes in climate variability shows an increasing trend in the state until 2050. The rate of increase in mean temperature is found to be 0.03◦c per year. Simulated mean temperature based on CORDEX data for the period 2015-2050 over Maharashtra display linear trend in projected annual mean temperature from 2015 till 2050 (Figure 3). It clearly points out scenario of increasing temperature which may be favorable for spread of malaria in state of Maharashtra.

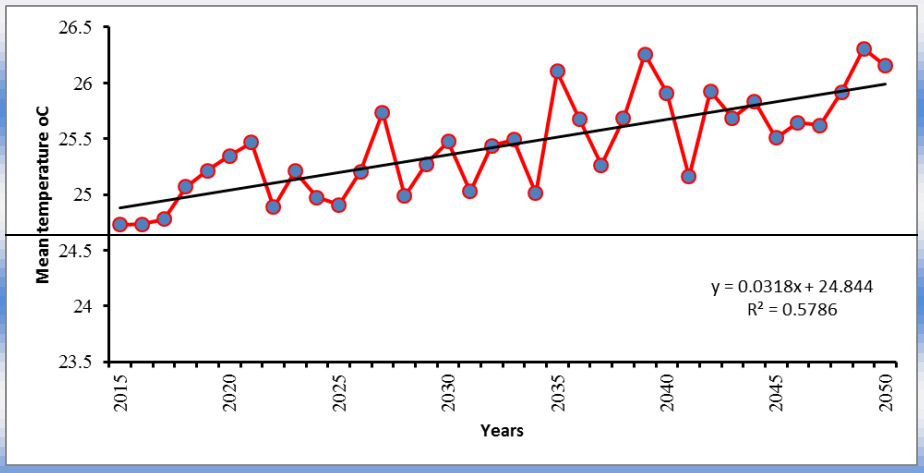


**Figure - 3: Simulated** Mean Temperature based on CORDEX data for the period 2015-2050 over Maharashtra.

**Geospatial Data Overlay Analysis in *m-cloud***

Geospatial data overlay analysis is performed in order to derive geospatial statistics of malaria information mapping in Maharashtra, India. It superimposes vector and raster geospatial database created by QGIS software. The data is collected in excel and formatted into trained data in *.csv format*. The .csv format data is then converted into ESRI shape file format with QGIS tools. In the current scenario, it designed the malaria information geospatial data for processing in *m-cloud*. After storing the data, overlay analysis is performed with raster and designed vector data. In QGIS, a plug-in named QGIS Cloud was installed and updated for storing the created geospatial vector database. The same vector data is then stored in the cloud database as layer. After successful uploading of vector layer, it automatically generates the link. Figure 4, 5, 6 show the overlay operation on thick (desktop), thin (browser) and mobile client platform in m-*cloud*

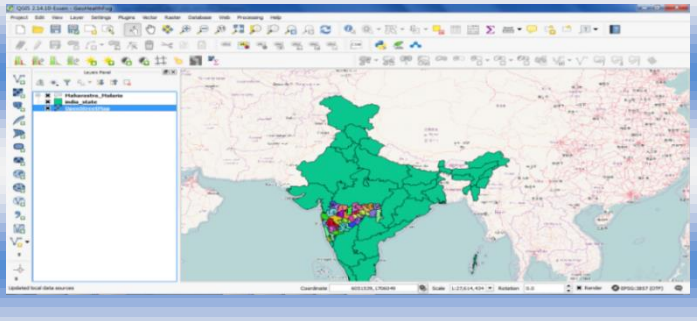

**Figure 4:** Integration of Malaria Information Infrastructure Mapping in Maharashtra, India on thick in *m-cloud*

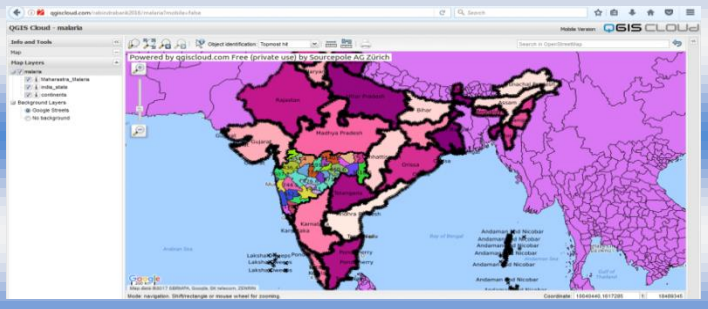

**Figure 5:** Integration of Malaria Information Infrastructure Mapping in Maharashtra, India on thin in *m-cloud*

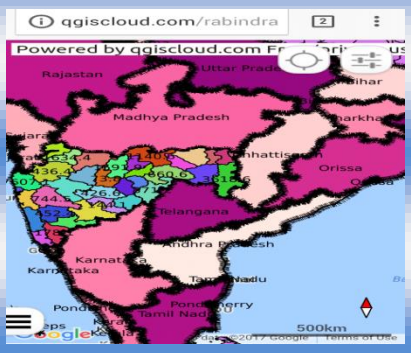


**Figure 6:** Malaria Information Infrastructure Mapping in Maharashtra, India on Mobile client in *m-cloud*

**Model Performance**

The present study has taken Geospatial database of malaria information in Maharashtra, India as a suitable case study in the developed *m-cloud* framework. Here, it has presented the various data analysis and geospatial overlay approaches. It also validated the geospatial analysis techniques on malaria information geospatial database. Space based imagery has made it possible easy to collect information for vast and inaccessible areas. It has also enabled to develop best configuration of malaria information infrastructure with the help of Cloud SDI Model. The developed Cloud SDI Model has great potential for use by the administrators and decision makers. The developed model can be widely using in public health studies. Novel public health strategies of prevention and control of malaria, dengue and chikunguniya will benefit in their mitigation by using this model.

**Concluding remarks**

The developed Cloud SDI Model can have great potential for the decision makers and planners to quickly look into the problems and resolute accordingly. In order to check with projected value CORDEX data fig. 3 clearly shows the scenario of increasing temperature over Maharashtra which may be favorable for spread of malaria hence may contribute to increase in the death rate. Therefore it is very relevant that decision makers of the concern departments of health and others have to take necessary prevention and control. Climate change and global warming resulted in sting to mosquito bites, in vector borne diseases.

**References**

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# IMSP NEWS

## A brief Report on the "Special Lecture by Dr. K. J. Ramesh, Former DGM, IMD" and IMSP Annual General Body (AGM) meeting, held on 14th August 2019 at IITM Pune

**The Annual General Body Meeting (AGM) of IMSP was held on 14th August 2019 at Meghdoot Complex of IITM Pune. On this occasion, a special lecture by Dr. K. J. Ramesh, Former DGM IMD, was organised at 3:30 pm at the above venue. The title of the special lecture was "Monsoon Climate Variability & Prediction of Extremes**". Dr. J. R. Kulkarni (IMSP Chairman) introduced the speaker. In his talk, Dr. Ramesh elaborated recent advances in the field of monsoon variability and prediction of extreme events. Prof. Ravi S. Nanjundiah, Director IITM, Dr. Krishnan, Sci. G & Executive Director CCCR, Dr. A. K. Sahai, Sci. G. & Vice President IMS national executive council, Shri S. M. Jamadar Member IMS national executive council, scientists of IITM, IMSP members and students (totalling more than 150 persons) attended the talk. The talk generated a lot of interest in the subject. Mr. S. Mahapatra, Secretary IMSP, thanked the speaker for his very informative and interesting lecture, presented in a very simple manner.

At 4.30 pm, AGM of IMSP started. About 100 members were present for the meeting. As number of members attended fulfilled the quorum condition, the meeting started under the Chairmanship of Director IITM.

1) Mrs. Latha Sridhar, member of executive council of IMSP anchored the proceedings. She welcomed all the members and dignitaries.
2) Chairman Dr. J. R. Kulkarni welcomed the guests and members for the AGM. In his speech, he thanked the guests, Director IITM, IMD & national council of IMS for generous support to the activities of IMSP. He gave special thanks to all the IMSP executive council members for the hard work put for conducting various activities of IMSP. He told that IMSP will be arranging farmer's workshop at Sangli and Parbhani in near future. Workshop at Sangli was almost finalized but due to flood situation, it has been postponed.
3) During this occasion, IMSP felicitated Prof. Ravi S. Nanjundiah for receiving IMS fellowship & Fellow of Indian Academy of Sciences (IAS) and his great support to IMSP activities. IMSP felicitated Dr. K. J. Ramesh Ex DGM IMD and Dr. D. S. Pai Head, CR&S IMD Pune for their kind help & support to IMSP activities. IMSP felicitated some IMSP Life Members, who received honors and MoES awards recently. These included Dr. R. Krishnan (Executive Director, CCCR-IITM & Past Chairman, IMSP) for being elected as a Fellow of the Indian National Science Academy (INSA); Dr. Sreenivas Pentakota (Scientist E, IITM) for being selected as Associate of Indian Academy of Sciences; Dr. Anupam Hazra (Scientist F, IITM) for receiving MoES Certificate of Merit for the year 2019 and Mrs. Swati U. Athale (Scientific Officer Gr. II, IITM) for her MoES award (2019). IMSP felicitated Mr. V. H. Sasane (of IITM) for his significant support & help to IMSP during organization of AMW-2018 and Prof. D. R. Sikka memorial National Symposium. IMSP felicitated Dr. A. K. Sahai, Vice President IMS NEC; Mr. Sikandar M. Jamadar, Member IMS NEC; and all executive council (EC) members of IMSP, who worked hard for the successful organization of annual monsoon

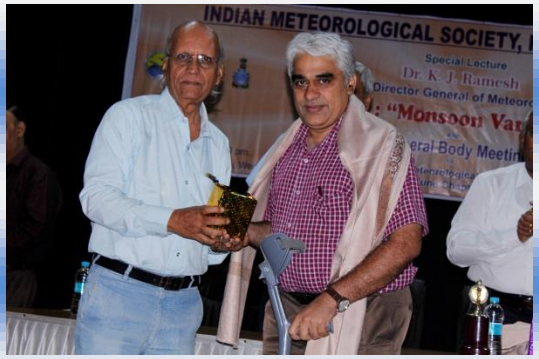
workshop (AMW-2018) and two days' Prof. D. R. Sikka memorial National Symposium, held during March 2019 at IITM Pune.

4) Mr. S. Mahapatra, Secretary IMSP, presented a brief report of the IMSP activities carried out during last one year, since the induction of new EC of IMSP (taking charge from earlier EC).
5) Mr. Jose Samuel, Treasurer IMSP, presented the accounts of IMSP for the financial year 2018-19 (1st April 2018 to 31st March 2019). The account report was passed unanimously.
6) Then, the floor was made open to all members for giving their suggestions. Some members expressed that the teacher's training program has been a good activity. After the program, a review meeting of the teachers may be conducted to know how they have disseminated the knowledge gained in the workshop to students of their schools. Chairman told that this suggestion will be implemented this year. Other suggestion was regarding pursuing for getting funds for next annual workshop. Chairman informed that this year more efforts will be devoted to get more funding.

7) Dr. G. Pandithurai, Co-Chairman IMSP, presented the vote of thanks. He thanked dignitaries, sponsors, IMSP members, IMSP office bearers, office administration of IITM & IMD and all volunteers for their kind support and help for various activities of IMSP.

Meeting ended with High tea (tea and snacks), arranged for the members and guests.

**Some Photographs, taken on the occasion:**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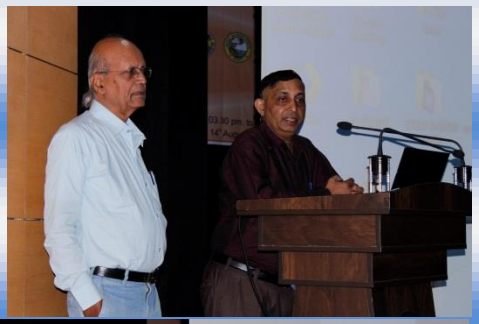


# IMSP

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