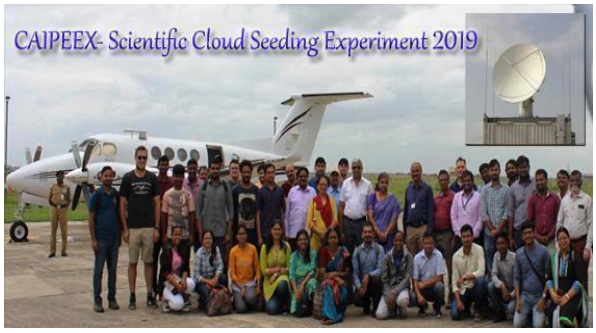
IITM News Letter
Quarterly e-Newsletter of Indian Institute of Tropical Meteorology
Volume 2 | Issue 1 | January 2020

ACHIEVEMENTS

CAIPEEX Scientific Cloud Seeding Experiment: In the second year of this experiment, 240 hours of observations were conducted during 29 July – 15 October 2019 by using a seeder (Beechcraft C-90) and an instrumented research aircraft (Beechcraft B200) for airborne cloud seeding and *in-situ* observations in clouds. A total of 234 randomized seeding cases with aircraft reported for CAIPEEX Phase-IV. This is the highest number of randomized seeding cases in any such experiment. The experiment also yielded 108 Physical evaluation cases with 56 hygroscopic and 52 Glaciogenic cases. With this, CAIPEEX has achieved its major objective of conducting the physical and statistical experiment on cloud seeding.

Mobile observations campaign: After the completetion of Aircraft Observational campaign, a surface survey of aerosol distribution was carried out with the available aircraft instruments for 2 weeks. This was done to understand the introduction of local aerosol into the atmosphere over the surveillance area. Ground based observations are being conducted regularly at Solapur and Tuljapur ground sites.



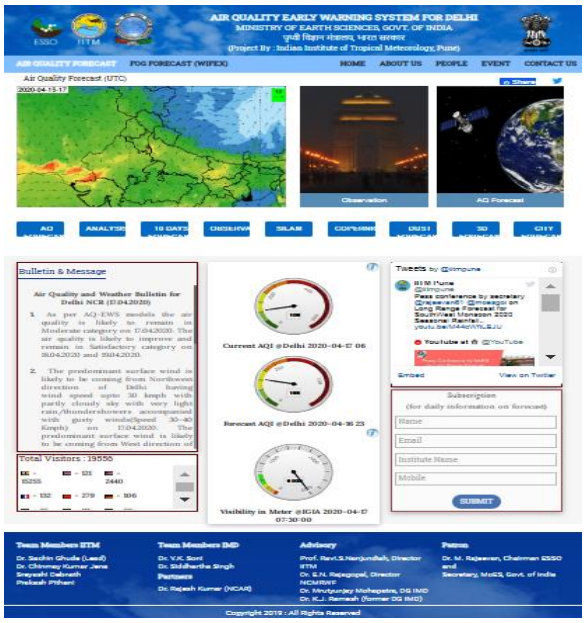
Airborne experiment at Solapur Airport during visit of Director IITM and Heads of participating institutes of CAIPEEX program.

Establishment of Atmospheric Research Testbed (ART) facility in central India: IITM has signed an agreement with Madhya Pradesh Government to acquire 100 acres of land for the establishment of ART laboratory at Silkheda village in Sehore District of M.P (about 50 km from Bhopal) on 20 November 2019. This facility will have state-of-the-art experimental equipment including multi-frequency radars, wind profilers and other land-atmosphere measurements. It is a highly focused observational and analytical research effort that will compare observations with model calculations in the interest of accelerating improvements in both observational methodology and monsoon prediction models.

Signing of land agreement by District Collector, Sehore (MP) and Director, IITM, on 20 November 2019 for setting up of Atmospheric Research Test bed lab-Central India in Sehore, Madhya Pradesh.

New Product: Air Quality Early Warning System for Delhi: The website on Air Quality Early Warning System for Delhi *(http://ews.tropmet.res.in*) is made available for Public. The system has been developed jointly by the scientists at the Indian Institute of Tropical Meteorology (IITM), Pune, India Meteorological Department, National Centre for Medium-Range Weather Forecasting (NCMRWF) and National Center for Atmospheric Research (NCAR), Boulder, USA to predict extreme air pollution events in Delhi and provide warnings to take necessary steps as per Graded Response Action Plan (GRAP). Globally, IITM has taken a lead in a race to provide a very high-resolution (400 meters) operational air quality forecast using both satellite (3km resolution) and surface (at city scale with 43 monitoring stations) chemical data assimilation integrated with dynamical downscaling. The air quality forecast can be accessed thorogh the provided website. A glimpse of website is provided here. The website also shows forecast verification for Delhi on a daily basis. It is observed that, after Diwali, the high-

resolution forecast could able to capture day to day air quality conditions quite near to observations including Diwali and current air quality emergency situations in Delhi.



Winter Fog Prediction System for north Indian region:

An Early Warning System for winter fog has been initiated to predict Fog at different airports, road & rail networks in the northern region of India. For disseminating fog forecasts to the public efficiently, a dedicated website is made available: *https://ews.tropmet.res.in/fog_forecast.php*

Fog forecasting system developed by IITM WiFEX team is based on 8 member physics ensemble using IMD GFS IC/BC and NCMRWF NCUM IC/BC and provides a forecast for the next 48 hours in terms of visibility and Liquid water content (LWC). The modeling framework typically consists of a high-resolution WRF model (2km, 4km & 400m) at IITM Pune.

The warning system consists of: i) near real-time observations from the WiFEX site at IGI Airport, Delhi; ii) predictions of visibility, fog onset, and dissipation based on a state-of-the-art numerical weather prediction model; iii) warning messages, alerts, and Bulletins. The warning system also provides a visibility forecast for 10 airports of northern region of India,and for major road and rail networks. Daily observations of Radiometer profiles (Temperature, Humidity & Liquid water Profiles), Ceilometer aerosol backscatter, visibility (at 2m and 102 m), and AWS data (10 m and 102 m) are also being made available on the observations webpage (*https://ews.tropmet.res.in/fog-observation.php*).

Visibility at different runways are available at: *https://ews.tropmet.res.in/fog_runway_visibility.php* (from the IMD website). The WiFEX data is made available on request basis as per the WiFEX data policy for scientific research.

Development of Skilled manpower in Earth System Sciences (DESK): DESK at IITM is coordinating with MoES and its institutions for recruitment of research fellows under MoES Research Fellow Program (MRFP). The FIRST batch of MoES Research Fellow Program (MRFP) successfully completed the initial training at IITM. Further, all of them joined their assigned MoES Institutions on 16th December 2019.

Emission Inventory Campaign 2019-20 for Pune Metropolitan Region under SAFAR program: IITM-SAFAR in collaboration with SPPU, Pune led the "Emission Inventory Campaign" for Pune metropolitan region for accounting the sources of emission from various sectors. The campaign began on 25th September 2019. In this campaign more than 120 students, volunteers from different colleges have participated. Survey was conducted in sectors viz., transport, residential, slum, hotels and street vendors in 40 hotspots of Pune. They have collected emission source data for Pune. This data is of great scientific importance as it will help in improving Air Quality Forecast for Pune region. As a part of the Diwali campaign 2019, particulate matter sampling for chemical characterisation from Delhi, Ahmedabad & Pune were also carried out during 25-31 October 2019.

Valedictary function of SAFAR Emission Inventory Campaign 2019-20, held on 10th January 2020 at IITM, in presence of Prof. Nitin Karmalkar, Vice Chancellor, SPPU and Prof. Ravi S. Nanjundiah, Director IITM and Dr Gufran Beig, Project Director SAFAR-India.

Campaign of emission inventory of Stubble burning in Punjab and Haryana: Stubble burning as one of the factor responsible for deteriorating Air quality of Delhi in winter months. As per the requirement of Central Pollution Control Board (CPCB) & ENVIRONMENT POLLUTION (PREVENTION & CONTROL) AUTHORITY (EPCA), SAFAR-IITM along with Utkal University have developed the dynamic emission inventory of PM2.5 due to biomass burning. To further strengthen and validate the emissions, SAFAR Mobile van has been deployed at various stubble burning locations in Punjab and Haryana in a campaign mode from October 2019 to December 2019 to continuously measure the pollutants before, during and after stubble burning. The study aimed to improvise the understanding and variability of various pollutants. The emission of various pollutants is calculated on daily basis using statistical model cum satellite data to improve the air quality forecasting over Delhi.

A noble initiative by IITM to make Green Skill Development Champions: A new concept of practical and applied training course in the field of atmosphere and environment is initiated by IITM, Pune. **Green Skill Development programme (GSDP)** the second in series was conducted by IITM ENVIS Center. Under the Government of India's priority project GSDP, as part of nation wide initiative, one month duration, two courses: i) Emission Inventory and ii) Pollution Monitoring were conducted. The aim is to enable India's youth to get employment or self-employment in the environment or forest sector known as GSDP. Photographs (below) captured during the inauguration of GSDP on 15 October 2019 at the hands of Ms. Urmila, Joint Director, Ministry of Environment and Forest & Climate Change and Prof. Ravi Nanjundiah, Director, IITM. Around 55 candidates participates in this training program.

18th International Conference on Clouds and Precipitation (ICCP 2020): Local Organizing Committee (LOC) is constituted for the preparations and arrangements for ICCP 2020. All necessary preparations are underway to conduct the Conference. ICCP 2020 Conference website has been in-house designed and developed as per ICCP Commision requirements by Library, Information and Publication Division in coordination with Project Director- CAIPEEX & LOC. The website (*https://iccp2020.tropmet.res.in/home*) has been made live in November 2019. The conference website has the complete online system for abstract submission, assigining reviewer, review of paper, declaration of status of paper, registration, payment,etc. This is for the first time IITM has implemented in-house complete online system for Conference. A glimpse of Conference homepage is shown below.

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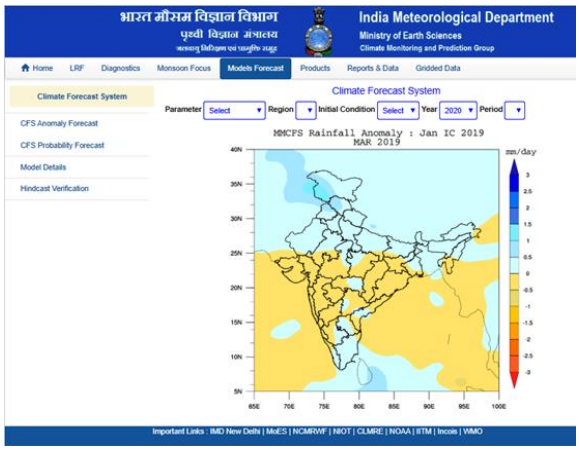
Monsoon Mission

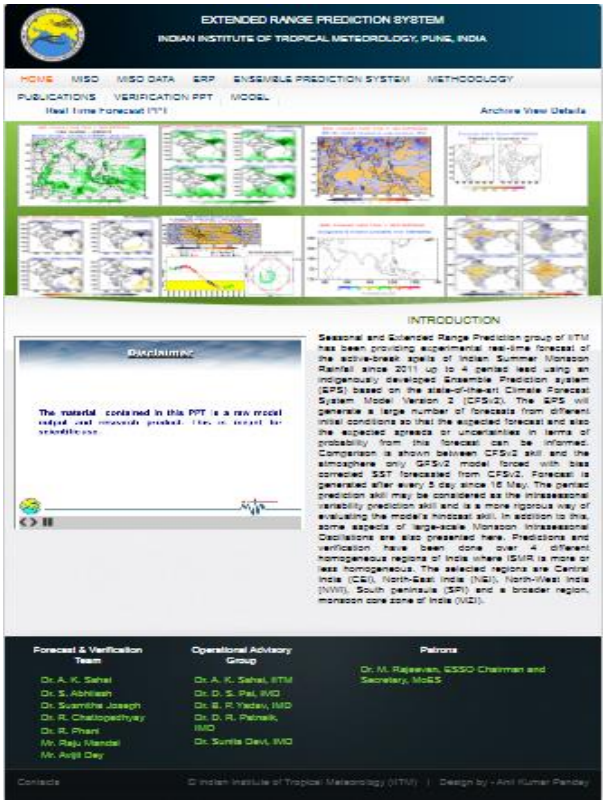
Seasonal Prediction: The operational seasonal forecast runs (using Monsoon Mission Climate Forecast System) are being carried out at IMD. The latest seasonal forecasts are disseminated through website: *http://www.imdpune.gov.in/Clim_Pred_LRF_New/Models.html*. All the necessary assistance to IMD scientists on this activity are being provided by IITM researchers. A glimpse from website showcasing seasonal forecasts is shown below.



To meet the requirements of high resolution model outputs for applications such as agriculture and hydrology, dynamical downscaling of seasonal forecast models has been attempted at a resolution of ~38 kms. The initial results show an improvement in mean rainfall and extreme events. Further applicability to the applications (reserviour management practices) is being tested.

Extended Range Prediction: The extended range prediction products for research/scientific use based on weekly initial condition are being made live at http://www.tropmet.res.in/erpas/. These forecast products are based on the real time weekly operational forecast generated by IMD using the Multi Model Extended Range Prediction System developed at IITM. Rainfall, Maximum & Minimum temperatures, MJO forecasts, soil moisture (0-10 cm), Relative humidity, and Cyclogenesis predictions are also made available at the same link. The MME forecasts are prepared using CFS (T126 & T382) and GFS (T126 & T382). Each resolution of CFS and GFS is having 4 ensemble members. The IMD operational products are made available at *http://nwp.imd.gov.in/erf_outlook.php*

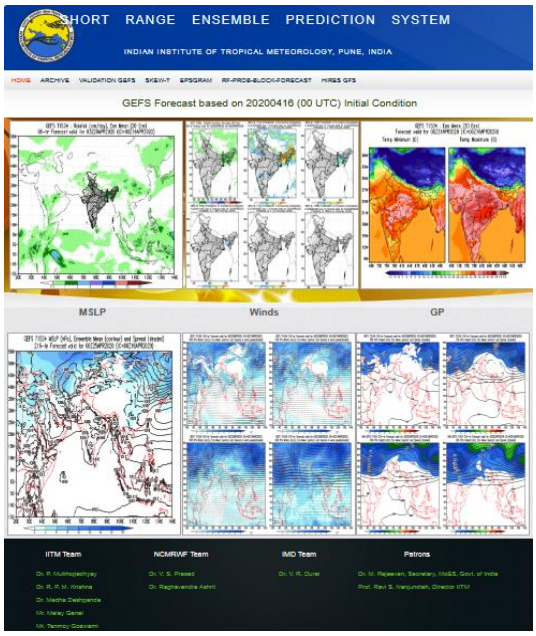
A glimpse from ERPAS website is shown below.



Global Forecast System for Short Range Forecast: The forecast based on Global Ensemble Forecast System (GEFS) T1534 and Global Forecast System (GFS) T1534 is continuously being operational by IMD. Global highest resolution (12 km) Ensemble Prediction System (EPS) with 21 ensemble members for short range forecast system based on

GEFS (T1534) has been made available to IMD for operational implementation. The high resolution short range EPS has been operationalized at IITM. The latest version 14 of GEFS has been implemented for operational forecast in IMD.

The Probabilistic forecast for all the river basins of India have been developed and shared with IMD, New Delhi. It has been utilized by IMD's Flood Monitoring Offices (FMOs) at different places. Since September 2019, the product is operational at IMD, Delhi. These forecasts are available online at: https://srf.tropmet.res.in/srf/hires_gefs/index.php
A glimpse from website is shown below.



National Facility for airborne Research (NFAR): Procurement of Instrumented Aircraft System (IAS) for atmospheric research is in process.

The land acquisition proposal for hangar facility at Aurangabad airport is approved by the Airport Authority of India (AAI) Board of Directors.

To understand the atmospheric processes in the lowest layer and its impact on climate, the utility of a new platform/tool "Unmanned Aerial Vehicle" (UAV) has been explored. Using the UAV, the observational gap areas between the ground-based and the aircraft observations can be covered. Unmanned Aerial System Laboratory for Atmospheric Research is being established at IITM to take up various research activities with UAVs for lower atmospheric studies.

IITM has installed Sky Imager for measurements of cloud properties on 22 October 2019. It has been successfully tested for software and data products.

High-Altitude Cloud Physics Laboratory (HACPL): Data analysis training of Single-Particle Soot Photometer (SP2) was conducted during 13-19 October 2019.

Thunderstorm Dynamics: A Phased Array Doppler Sodar System has been installed at Sanjay Ghodawat University, Kolhapur to study the wind structure in the Atmospheric Boundary Layer. The sodar would complement the micrometeorological observations of 5m tower that has already been installed there. These observations are being made under the MoU signed between SGU, Kolhapur and IITM Pune.

Fluid Dynamics Laboratory (FDL): Spectral analysis of hotwire data in FDL has been initiated. Hardware and Software Upgrades for PIV systems in FDL have been installed and tested.

Under the Metflux project, soil CO_2 sensor was installed successfully at the micrometeoroogical tower site of Kaziranga National Park, Assam during 7-11 November 2019.

RESEARCH HIGHLIGHTS

IITM study on how the MJO and global rainfall patterns are changing due to Indo-Pacific warming: The rainfall pattern across the globe is likely changing due to rapid warming of the Indo-Pacific Ocean, reports the study published in the journal Nature. The study shows that Indo-Pacific warm pool has been warming rapidly and expanding during the recent decades in response to increasing carbon emissions. The warm pool expanded double its size, from an area of 2.2 million km^2 during 1900–1980, to an area of 4 million km^2 during 1981–2018. The rate of expansion is 4 × 105 km^2, an area equal to the size of California (or Spain), every year. This expansion of warm pool has altered the most dominant mode of weather fluctuation originating in the tropics, known as the Madden Julian Oscillation (MJO).

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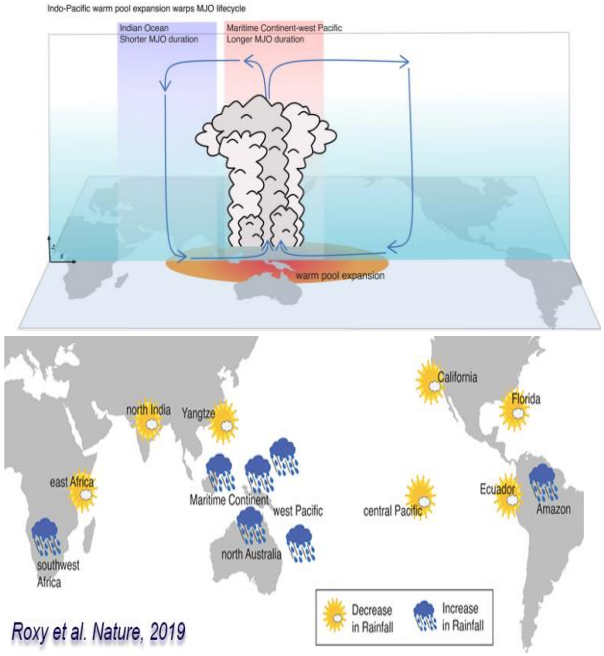
Though the entire Indo-Pacific has warmed, the warmest waters are over the west Pacific, creating a temperature contrast that drives moisture from the Indian Ocean to the west Pacific Maritime Continent, enhancing the cloud formation there. As a result, the lifecycle of MJO has changed. The residence time of MJO clouds have shortened over the Indian Ocean by 4 days (from an average of 19 days to 15 days). Over the west Pacific, it increased by 5 days (from an average of 18 days to 23 days). It is this change in the residence time of MJO clouds that has altered the weather patterns across the globe.

The changes in MJO behavior have increased the rainfall over northern Australia, west Pacific, Amazon basin, southwest Africa, southeast Asia (Indonesia, Malaysia, Philippines and Papua New Guinea), the small islands in the West Pacific. At the same time these changes have brought a decline in rainfall over small islands in the central Pacific, along the west and east coast of United States (e.g., California), north India, east Africa, and the Southeast China. ***Read full article at: Roxy M.K. et al, Nature****, DOI:10.1038/s41586-019-1764-4.*



Simulations of Monsoon Intraseasonal Oscillation Using Climate Forecast System Version 2: Insight for Horizontal Resolution and Moist Processes Parameterization: This paper analyses the Climate Forecast System version 2 (CFSv2) model in three resolutions, T62, T126, and T382. Evaluation of performance of all three resolutions of CFSv2 in simulating the Monsoon Intraseasonal Oscillation (MISO) of the Indian summer monsoon (ISM) has been done by analyzing a suite of dynamic and thermodynamic parameters. Results reveal a slower northward propagation of MISO in all the models with the characteristic northwest–southeast tilted rain band missing over India. The anomalous moisture convergence and vorticity were collocated with the convection center instead of being northwards. This affected the northward propagation of MISO. The easterly shear to the north of the equator was better simulated by the coarser resolution models than CFS T382. The low level specific humidity showed improvement only in CFS T382 until ~15°N. The analyses of the vertical profiles of moisture and its relation to rainfall reveal that all the resolutions of CFSv2 have a lower moisture in the within 850 hPa and a drier level above. This eventually hampers the growth of deep convection in the model. Models particularly fail to show the low level moistening ahead of deep convection and heavier rain rate (shown in below figure). These model shortcomings indicate a possible need of improvement in moist process parameterization in the model in tune with the increase in resolution. read more at: ***Tirkey S. et al, Atmosphere****, DOI:10.3390/atmos10080429, 1-20.*

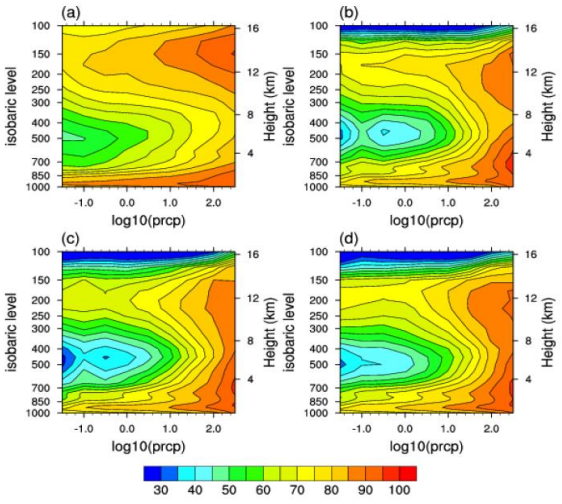


Figure showing composite of vertical profile of relative humidity (%, shaded) with respect to precipitation for MISO events for (a) Observation; (b) T62; (c) T126, and (d) T382.

Impact of Multiyear La Niña Events on the South and East Asian Summer Monsoon Rainfall in Observations and CMIP5 Models: Impact of multi-year La Niña events on South and East Asian summer monsoon rainfall are examined in the observations and Coupled Model Intercomparision Project Phase 5 (CMIP5) models. This study considered 2-consecutive year La Niña events which peaked during winter for the period of 1948 - 2016. The analysis is carried out for the successive two summers, referred to as the first and second years. Composite analysis suggests that La Niña related Sea Surface Temperature (SST) cooling is significantly high in the central and eastern equatorial Pacific and adjoining North-American coast during the first year summer. This anomalous cooling associated with La Niña is slightly shifted towards south and south-central Pacific Ocean during the second year. An Atlantic Niño like pattern is evident in the first year unlike the second year. Negative rainfall anomalies are apparent over most of the south Asian region except Bangladesh and Sundarbans, during the first year. Contrastingly, positive rainfall anomalies over the south Asian monsoon region is noted during the second year. The east Asian monsoon region reported a tri-pole like structure in the rainfall anomalies, with positive values over southern and central China and negative over parts of Myanmar, Thailand and Cambodia regions and north-east China – North Korea during the first year and vice-versa in the second year (shown in below figure). A positive-negative-positive structure in the VIM anomalies is seen in the East Asian region and it supports similar rainfall anomalies during the second year. Further, it is examined that the ability of CMIP5 models in representing multiyear La Niña teleconnections to the south and east Asian summer monsoons. The factors responsible for weak teleconnections in the models are discussed in detail in paper ***Raj Deepak S.N. et al, Climate Dynamics***, *DOI:10.1007/s00382-018-4561-0,6989–7011.*

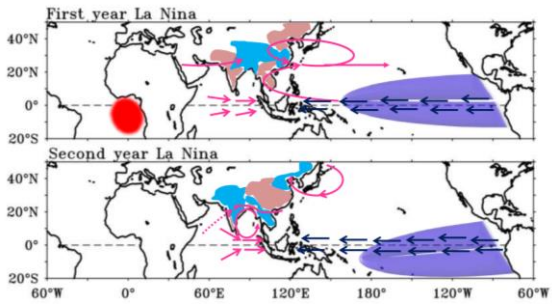


Figure (above) showing schematic diagram that shows summer rainfall, circulation and SST patterns over South Asia, East Asia and Pacific region during Multi-Year La Niña events. Lavender colour show SST cooling associated with La Niña and red colour over Atlantic indicate SST warming related to Atlantic Niño. Blue and brown shading over South and East Asian region indicates positive and negative rainfall pattern respectively. Different coloured thick (dashed) arrows and curves indicate strong (weak) 850 hPa wind anomalies. Also see https://sciencetrends.com/multiyear-la-nina-events-effects-on-south-and-east-asian-summer-monsoon-rainfall/

Influence of dust and sea-salt sandwich effect on precipitation chemistry over Western Ghats during summer monsoon: Assessment of Sea Salt (SS) and Non-Sea Salt (NSS) aerosols in rainwater is important to understand the characterization of marine and continental aerosols and their source pathways. Sea salt quantification based on standard seawater ratios are primarily constrained with high uncertainty with its own limitations. The rainwater composition during strong south-westerly wind regimes (cluster 2-oceanic) was profoundly linked with high sea salt and dust, whereas north-westerly low wind regimes (cluster 1-continental) showed increase in SO_4^{2-} and NO_3^-. However, SO_4^{2-} abundance over NO_3^- in rain water depicted its importance as a major acidifying ion at the region. The satellite based observations indicate the presence of mid-tropospheric dust at top (3-5 km) and marine sea salt at bottom acts as a "sandwich effect" for maritime clouds that leads to elevated Ca^{2+}, Na^+, Mg^{2+}, and Cl^- in rainwater. This characteristic feature is unique as sea spray generation due to high surface winds and dust

aloft is only seen during this period. Furthermore, four source factors (secondary inorganic aerosol, mixed dust & sea salt, biomass burning & fertilizer use, and calcium neutralization) derived from PMF analysis showed contribution from local activities as well as long range transport as dominant sources for the rainwater species. Read full paper at: ***Yang, L. et al,*** *Scientific Reports, DOI:10.1038/s41598-019-55245-0, 1-13.*

Visualization of droplet dynamics data: The output data from DNS has been used to create a visualization of droplet evolution in turbulent flow. This work was accomplished with collaboration of Computational and Information Systems Laboratory (CISL) of the National Center for Atmospheric (NCAR). Authors have generated a video showing droplet growth. A paper related to this video was presented in SC19 conference (The International Conference for High Performance Computing, Networking, Storage, and Analysis). This paper was selected in the final list of SC19 showcase award. Few snapshot of this video is shown in figures below.

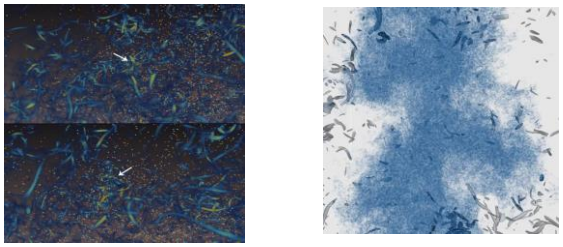


Figure: Left panel: Illustration of interaction of droplets with vortices. Right panel: Particle density field and isosurface of vorticity magnitude rendered in VAPOR software.

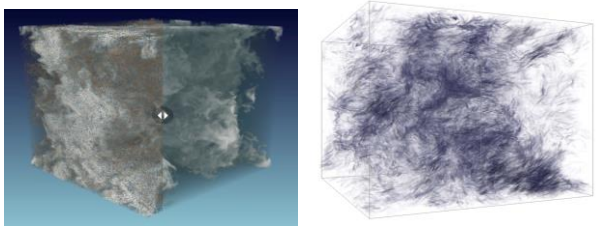


Figure: Left panel: Direct particle visualization using a newly developed application by NCAR. Right panel: Comparison of two movies playing simultaneously. For more details about this study, Dr Bipin Kumar, Scientist E (bipink@tropmet.res.in) may be contacted.

EVENTS and ACTIVITIES:

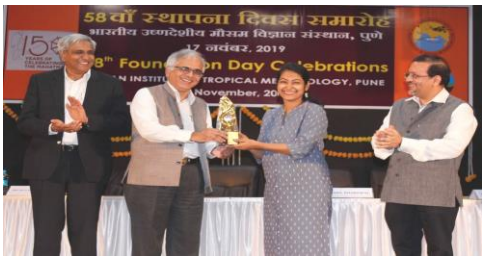
58th Foundation Day Celebration at IITM: IITM celebrated its 58th Foundation Day on 17 November 2019. On this occasion, Dr. Shekhar C. Mande, Secretary, DSIR and DG, CSIR was the Chief Guest, while Dr. Anil Bhardwaj, Director, PRL, Ahmedabad was the Guest of Honour. Various IITM awards for the year 2018 were presented viz. **Silver Jubilee Award** for the best research paper published in peer reviewed journal, **Dr. Ananthakrishnan Award** for the Best Ph.D. thesis, **Best Student Research Paper Award**, Best JRF Award, and the **Excellent Performance Awards** were presented to the Scientists, Research students, Scientific, Technical, Administrative support and MTS staff of the Institute. IITM employees who completed 25 years of service were also felicitated. The function also included special lectures by the award winners. A simple and colourful cultural programme was also arranged in the evening. Several ex-employees and special invitees, in addition to the existing employees and their families, attended the function.

(L-R) Prof. Ravi S. Nanjundiah, Dr. Shekhar Mande, Dr. Anil Bhardwaj

In the welcome address, **Prof. Ravi S. Nanjundiah**, Director, IITM highlighted the work done by the scientists of IITM and emphasised on recent developments such as Air Quality Early Warning System for NCR for predicting extreme air pollution events in Delhi, etc. Inaugural address was delivered by **Dr. Shekhar Mande**, Director General, CSIR, New Delhi. **Dr. Anil Bhardwaj**, Director, Physical Research Laboratory, Ahmedabad delivered the Foundation Day Lecture on the topic "Indian Planetary Missions: Challenges & Science".

Details of various IITM awards felicitated to IITM Scientists, Research Fellows and Employees during 58th Foundation Day Celebrations:

IITM Silver Jubilee Paper Award for the best research paper published in peer reviewed journal for the year 2018: 'Phenomenological paradigm for midtropospheric cyclogenesis in the Indian summer monsoon,' by **Dey Choudhury Ayantika, Krishnan R., Ramarao M.V.S., Vellore R.**, Singh M., Mapes B., published in **Journal of Atmospheric Sciences**, 75, September 2018, DOI:10.1175/JAS-D-17-0356.1, 2931-2954



Dr. Ayantika Dey Choudhury receiving IITM Silver Jubilee Paper Award

Dr. Ananthakrishnan Award for the Best Ph.D. thesis for the year 2018: **Dr. Gayatri Kulkarni** for her thesis entitled "Study aerosol effects on deep convective clouds with in monsoon environment based on observations and numerical modeling" under the guidance of Dr. Thara Prabhakaran (IITM & Savitribai Phule Pune University).

Dr. Thara Prabhakaran (PhD Guide) receiving Dr. Ananthakrishnan Award for the Best Ph.D. thesis on behalf of Dr. Gayatri Kulkarni.

The Best Student Research Paper Award for 2018: **Shri Mudiar Deepjyoti** received the award for his paper "Quantification of observed electrical effect on the raindrop size distribution in Tropical Clouds", published in Journal of Geophysical Research, 123, April 2018, DOI:10.1029/2017JD028205, 1-18.

Shri Mudiar Deepjyoti *receiving Best Student Research Paper Award.*

IITM Junior Research Fellow Best Student Award was given to **Ms. Rituparna Sarkar** (1st position) and **Mr. Sandeep J.** (2nd position).

Ms. Rituparna Sarkar receiving IITM Junior Research Fellow Best Student Award

IITM Excellent Performance Award for the year 2018 for the Scientific, Administrative, Support and Multi-Tasking Staff categories were given to **Dr. Deewan Singh Bisht, Smt.Yogita Kad, Shri Sandip Kulkarni** and **Shri Rakesh Bhandari** respectively.

Dr. Deewan Singh Bisht, Shri Sandip Kulkarni and Shri Rakesh Bhandari receiving "IITM Excellent Performance Award' respectively.

All the Award lectures are available at IITM YouTube Channel. Photographs of the complete event are available at photogallery section of IITM website.

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International Workshps at IITM

International Workshop on Prediction Skill of Extreme Precipitation Events and Tropical Cyclones: Present Status and Future Prospect (IP4) & **Annual Climate Change** was organized at IITM during 25-28 November 2019. The workshop was inaugurated by Honorable Dr. M. Rajeevan, Secretary to the Govt of India, Ministry of Earth Sciences as Chief Guest of the function. Prof. Kerry Emanuel from MIT, USA and Prof. Graeme Stephens, JPL, CALTECH, NASA, were present as the Guest of Honours. Prof. Ravi, S. Nanjundiah, Director, IITM, Dr. R. Krishnan, Executive Director, CCCR, IITM were also present in the inaugural programme. Around 100 participants from India and abroad viz., Canada, USA, UK, Italy, Korea and Japan attended the workshop. Experts from International and National centers/Institutes/ universities have delivered talks on specific topics of improving the forecast of extremes, tropical cyclones and also in the climate change perspective. The event was live streamed and many attended remotely and participated through remote participation. The event has been widely published through print and electronically media.

Complete contents of IP4 including presentations/ posters are archived and made available for research community through website: *https://www.tropmet.res.in/ip4/*

Photographs captured during the inaugural Function of IP4. More photographs can be visited at: https://www.tropmet.res.in/140-gallary

Weather and Climate Science for Service Partnership (WCSSP) India: Impact-based Forecasting (IbF) Workshop was held at IITM, Pune during 29-30 November at IITM, Pune. The workshop aimed to provide an overview of the current research being undertaken within this field in India and the UK, to identify future research steps that can be undertaken within WCSSP. Research gaps and opportunities identified would be informed and prioritised the research direction of WP3 'Risk-based forecasting and high-impact weather/seasonal climate events'. A delegation of 8 scientists from UK Met Office attended the workshop along with other 20 Indian scientists from IMD, NCMRWF, IITM, INCOIS, NCCR, NRSC. The meeting was inaugurated by Dr. M. Mohapatra, Director General of Meteorology, IMD, Dr. Ravi S. Nanjundiah, Director, IITM and Dr. Parvinder Maini, Adviser, Ministry of Earth Sciences.

Group photograph captured during the Workshop.

IUKWC activities: IUKWC actively participated in the 2nd International Conference on Sustainable Water Management organised by the Ministry of Jal Shakti under the National Hydrological Project (NHP) in Pune during 6-8 November 2019. The centre participated in the exhibition, organised under the conference. Through the exhibition, the centre aimed to disseminate outputs generated from its various activities over the past three years as well as engage with stakeholders from various water resource management departments in India. The outputs were very well received by the scientific and stakeholder community and the exhibition helped spread the word about collaborative opportunities undertaken by the centre in the water security sector in India. This participation resulted in considerable new applications from the stakeholder community to become a part of the IUKWC Open Network. Glimpses of IUKWC participation in the aforesaid Conference and Exhibition.

Academic Activities:

21 students have joined the MoES Research Fellow Program (MRFP) 2019 batch. The MRPF classes began from 23 September 2019 by involving 15 faculty members. These faculty members were also conducting IITM JRF training Program.

Ph.D. Interviews were conducted for 40 candidates on 23 November 2019. This interview was for DASS, SPPU, with IITM, Pashan, Pune as research centre.

Examination papers were set for MRFP students. Written examination was held during 2-6 December 2019.

Initial training of MRPF at IITM was completed on 13th December 2019 and were relieved to join their respective MoES Institute on 16th December 2019.

5 days training program was arranged at IITM for 10 Flight Lieutenant from Indian Air Force, Directorate of Meteorology, during 9-13 December 2019 by DESK. The participants were felicitated with the Certificate of Participation.

User Education session on "**Grammarly**" Writing Support Tool for researchers was conducted on 1st October 2019.

In-house training sessions on **E-Office Suite** for e-filing was organised for each scientific group/division/section by National Informatics Centre Services Inc. (NICSI), New Delhi during 9-11 October & 17-23 October 2019 at IITM.

Air Pollution and Human Health (APHH) Promote Project meeting with UK delegates was held on 23 October 2019 at IITM to discuss the present status of the promote project as well as future plan.

Prof. R. Ananthakrishnan Seminar Series

Under this seminar series, following talks were delivered:

Dr. William Boos, Department of Earth & Planetary Science, University of California, Berkeley:

- Using simple energy inputs to understand tropical rainfall shifts in observations and models, 18 December 2019.
- How topography creates strong monsoons: Elevated heating and orographic insulation, 19 December 2019.

Dr. Prabir Patra, Senior Scientist, Jamstec, JAPAN & Visiting Professor at CERES, Chiba University, Japan

- Modelling CO_2 and CH_4 using JAMSTEC's ACTM, and contributions to the global and regional synthesis projects, 30 December 2019


(L-R) Dr. William Boos, Dr.Prabir Patra

A lecture on "Fundamental dynamics of monsoon depressions" was also delivered by Prof. William Boos during Monsoon Mission Discussion meeting on "Synoptic Systems of the monsoon" on 17 December 2019.

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IITM Outreach Programme

Following outreach programs were coordinated by Library, Information and Publication Division of IITM.

IITM activities for IISF 2019: IITM organised an Outreach Programme as a precursor to **India International Science Festival (IISF) 2019** during 31 Oct - 1 Nov 2019 wherein IITM's R&D facilities/ labs and achievements were showcased to visitors. Students also interacted with scientists.


5th India International Science Festival (IISF) 2019: IITM participated in IISF 2019, held at Science City in Kolkata during 5-8 November 2019. IITM volunteers showcased Institutes' achievements, R&D facilities, new Products/ Mobile Apps, etc. to visitors.



India International Trade Fair (IITF)-2019: IITM participated in MoES Exhibition at the **India International Trade Fair (IITF)** held during 14-27 November 2019 at Pragati Maidan, New Delhi. Ministry of Earth Sciences team received the **Gold Medal and a Certificate** at the hands of honorable **Dr. Piyush Goyal**, Minister of Industry & Commerce (Govt. of India) on 27 November 2019.

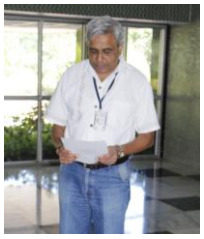

Chutka Scientific Literacy cum Health & Wellness Festival-2019: On behalf of Ministry of Earth Sciences, IITM Pune participated and represented MoES in "Chutka Scientific Literacy cum Health & Wellness Festival" during 5-7 December 2019, in Mandla (M.P). H'ble Union Minister of State of Ministry of Steel Shri Faggan Singh Kulaste inaugurated the Festival and visited IITM-MoES stall.


6th Biennial Conference OSICON 2019 Exhibition: IITM participated in the Exhibition during 12-14 December 2019, organised by Ocean society of India (OSI) held at Centre for Marine Living Resources & Ecology (CMLRE), Kochi, Kerala.

Special Days Observed at IITM

IITM observed **Vigilance Awareness Week** during 29 October – 02 November 2019. On this occasion, a pledge was administered by the Director, IITM among all the employees on 28 October 2018. As a part of Vigilance Awareness Week, a Slogan Competition and Essay Competition were arranged on the theme "Intigrity – A way of life". A talk by Shri M.R. Kadole, Suprintendent of Police/HOB, CBI and Shri Prasad P. Akkanouru, IPS, Deputy Commissioner of Police was arranged on 01 November 2019 and winners of the Essay and Slogan competition were felicitated with prizes.

Few glimpses from Vigilance Awareness Week are presented below.



National Unity Day (Rashtriya Ekta Diwas) was observed at IITM on 31 October 2019 by taking the pledge .

Samvidhan Diwas was observed at IITM on 26 November 2019 by taking the pledge by all IITM employees under the administration of Director, IITM .

IITM Participation in the Important Meetings

International

Sandwich Training Exchange Programme (STEP) fellow, Earth System Physics Section, International Center for Theoretical Physics (ICTP), Italy, 1 September – 29 November 2019.

Scientific Steering Committee session of World Weather Research Program (WWRP), at WMO, Geneva, 1-4 October 2019.

International Conference on "Regional Climate, (ICRC-CORDEX 2019)", Beijing, China, 14-18 October 2019.

First Technical Workshop of WMO Hydrological Status and Outlook System (HydroSOS), Nanjing, China, 11–13 November 2019.

South Asia Hydromet Forum-II, co-hosted by the World Bank (WB) in partnership with World Meteorological Organisation (WMO), Kathmandu, Nepal, 19–21 November 2019.

American Geophysical Union Fall Meeting 2019, San Francisco, USA, 9-13 December 2019.

National

Monsoon Mission Discussion meeting on Synoptic Systems of the monsoon, 17 Dec. 2019, IITM Pune.

Monsoon 2019 Review Meeting, 29 October 2019, IITM, Pune.

Steering Committee Meeting, MoES, New Delhi, 14 October 2019.

GISAT Project Review meeting, Space Application Centre SAC, Ahmedabad, 22 October 2019.

MoES Review Meeting (ESSO-Council), CMLRE, Kochi, 31 October to 1 November 2019.

Sixth Annual Edition of Urban Policy Dialogues, IIHS, Bengaluru, 5–6 November 2019.

85th Annual meeting of Indian Academy of Sciences, University of Hyderabad, Hyderabad, 8-11 November 2019.

TROPMET-2019, National Symposium on "Land, Ocean and Atmosphere Interactive Processes in the Context of Weather and Climate" at the Department of Meteorology and Oceanography, Andhra University, Visakhapatnam, Andhra Pradesh, 11-14 December 2019.

Sixth Biennial Conference of Ocean Society of India (OSICON–19): Indian Ocean Processes and Resources – a Key to Blue Economy, Centre for Marine Living Resources & Ecology (CMLRE), Kochi, Kerala, 12-14 December 2019.

AWARDS AND HONORS

IITM received '**Rajbhasha Shield**' for unique effort made towards popularising Science in regional languages through poster presentations using devnagari script at Hindi Sammelan and Karyashala organized by **Rajbhasha evam Prabandhan Vikas Sanstha** was held at Gangtok (Sikkim) during 12-14 November 2019.

B.N. Desai award: The paper entitled "Isotopic study of intraseasonal variations of plant transpiration: an alternative means to characterize the dry phases of monsoon", by Chakraborty S. , Belekar A.R., Datye A., Sinha N., published in Scientific Reports, 8:8647, 2018, DOI:10.1038/s41598-018-26965-6 has been adjudged the **Best Paper under the theme of Monsoon Research** by the Indian Meteorological Society, Tropmet-2019, Andhra University, 11 December 2019.

J. Das Gupta Award: The paper entitled, " On the precipitation susceptibility of monsoon clouds to aerosols using high altitude ground-based observations over Western Ghats, India" by Leena P.P., Anil Kumar V., Sravanthi N., Patil R., Chakravarty K., Saha S.K., Pandithurai G., published in Atmospheric Environment, 185, 128-136, has been adjudged the **Best paper for J. Das Gupta Award** on Atmospheric Observations and Technologies (2017-2018).

Dr. Suryachandra A. Rao: invited as an Expert/Member of the Assessment Committee for assessment of Technical Staff/Support Staff working at National Institute of Oceanography (NIO), Goa, 30 September 2019.

Dr. G. Pandithurai: invited as an external expert for a PhD pre-synopsis examination, 24 October 2019 at Defence Institute of Armament Technology (DIAT), Pune.

Dr. Sachin Ghude: elected as a SSC member of iLEAPs international project of Future Earth for the period 1 January 2020 to 31 December 2022.

Dr. Anoop Mahajan: selected for National Academy of Sciences, India - Scopus, (NASI-Scopus) Young Scientist Award for the year 2019.

Dr. Atul Kumar Srivastava: received the prestigious FinCEAL Plus BRIDGES Asia Research Grant from the Finnish Research Community for Visiting Research Scientist at the Finnish Meteorological Institute (FMI), Helsinki, Finland. He served as Visiting Scientist during 9 November - 8 December 2019. During the visit, he met Ms. Vani Rao, the Indian Ambassador at the Embassy of India, Finland on 27 November 2019 to discuss on the bilateral aspects of long-term scientific research activities to develop capacity building for intensive measurements to combat against the future climate implications due to air pollution.

Photograph: Dr Atul K. Srivastava during his visit to Finnish Meteorological Institute (FMI), Helsinki, Finland

Dr. P. Mukhopadhyay: convened an AGU Session as Convener along with Dr. Boualem Khuider, Dr. Xianan Jiang and Dr. Hannah Mary Christensen as co-convener entitled "Stochastic Parameterization and Climate Sensitivity in GCMs: Clouds, Precipitation, and Climate Variability" in AGU Fall Meeting, San Francisco, USA, 9-13 December 2019.

Dr. Padma Kumari: nominated as External expert member of Technical Evaluation Committee (TEC) constituted by IMD for the procurement of Thermoelectric Pyranometers under the plan scheme "ACROSS-IMD.

Dr. Bipin Kumar: chaired a session in the Indo-German conference on Computational Mathematics: Challenges and Opportunities Towards Exascale Computing (IGCM), IISC Bengaluru, 2-4 December 2019.

Dr. Milind Mujumdar: invited as Chief Guest to inaugurate the Science Exhibition at New English School Ghotawade, Pune, 12 December 2019. An inaugural talk on "The hydrological cycle" was delivered.

Dr. Ramesh Kumar Yadav: chaired the Technical Session "Ocean Processes" on 13 December 2019 at OSICON – 19, CMLRE, Kochi, Kerala, 12-14 December 2019.

Ms. Chaitri Roy: awarded the 2020-2021 Fulbright - Kalam Climate Fellowship by J. William Fulbright Foreign Scholarships Board (FSB), Washington, D.C. for Doctoral Research on 4 October 2019.

Mr. Kumar Roy: awarded the **AGU Student Travel Grant** to attend the AGU Fall Meeting at San Francisco, USA, 9-13 December 2019.

Mr. Emmanuel Rongmie: awarded First Prize for poster presentation entitled "Modulations of parameter essential for cyclogenesis by Tropical Waves over the North Indian Ocean" in TROPMET 2019, Andhra University, Visakhapatnam.

Mr. Kiran V.G.: awarded for **Best Poster Presentation** entitled "Summer monsoon strength and upwelling along the west coast of India", OSICON-2019, CMLRE, Kochi. 12–14 December 2019.

PhD. Awards

Mr. Sreeush M.G.: Thesis entitled, ""Forward and inverse modeling of Indian Ocean Carbon Cycle in a Biogeochemical model"" under the guidance of Dr. Vinu Valsala, Dr. Sreenivas Pentakota & Prof. K.V.S.R. Prasad, Prof. C.V.Naidu (co-guide), Andhra University, December 2019.

Mr. Srinivas Gangiredla: Thesis entitled, ""Impact of Pacific and Atlantic modes on Indian Summer Monsoon Variability and Indian Ocean Climate"" under the guidance of Dr.Jasti S Chowdary, IITM, Prof. K.V.S.R. Prasad & Prof. C.V.Naidu (AU), Andhra University (AU), October 2019.

Mr. Nitish Sinha: Thesis entitled "Isotopic studies of rainfall and its reconstruction from the Indian subcontinent" under the guidance of Dr. S. Chakraborty (IITM), Savitribai Phule Pune University, December 2019

Ms. Rashmi Kakatkar: Thesis entitled, "Understanding the subsurface variability in the Tropical Indian Ocean and its impact on the air sea interaction in coupled models"", under the guidance of Dr. C. Gnanaseelan and Dr. J.S. Chowdary (co-guide), Savitribai Phule Pune University (SPPU), December 2019.

Visitors

Dr. Sarang Shidore, University of Texas, Austin, Texas, USA visited CCCR, IITM and delivered a lecture on 'Intersecting Risks in a Climate Vulnerable India' on 4 October 2019.

Dr. Duncan Axisa and **Dr. Spencer Faber,** DMT, USA visited IITM on 21-22 October 2019 for discussion meeting with CAIPEEX group.

Mr. Kurt Hibert, Aircraft Pilot visited IITM on 23 October 2019 for discussion meeting with CAIPEEX group.

Dr. Shreya Dhame, University of New South Wales, Australia, visited CCCR, IITM during 10-11 December 2019 and delivered a talk on "Indian Ocean warming modulates global atmospheric circulation trends" on 10 December 2019

Other Activities

IITM Employees were deputed for Maharashtra State Assembly Election duty on 21 October 2019 as per the schedule for 'Presiding Officers', 'Polling Officers' and 'Micro observers'. In addition to this, employees were also deputed as "Micro observers" for Counting duty on 24 October 2019. IITM employees attended all the necessary training sessions arranged by Election Commission of India in the month of October 2019.

A day long Camp of Lung Function test "Impulse Oscillometry" was organised by IITM Recreation Club on 8 November 2019 for IITM Employees.

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