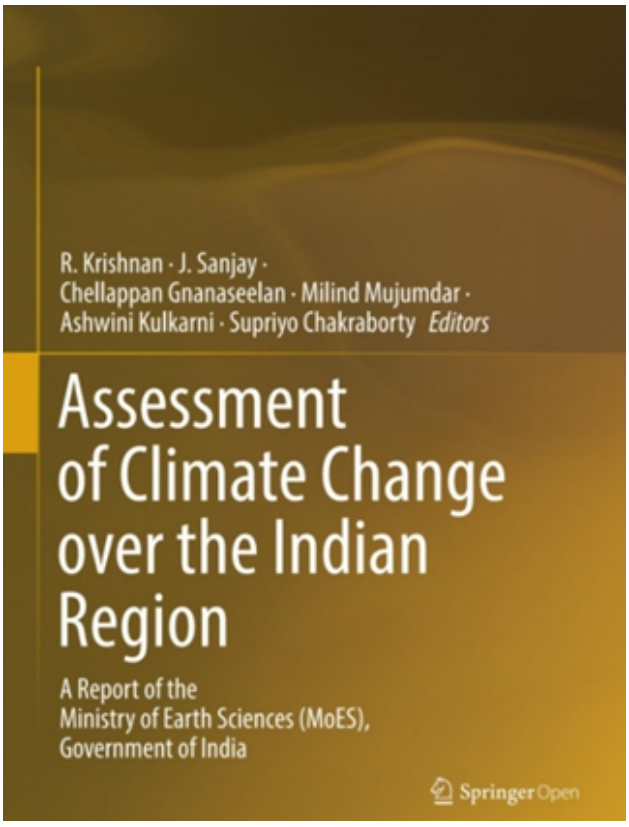
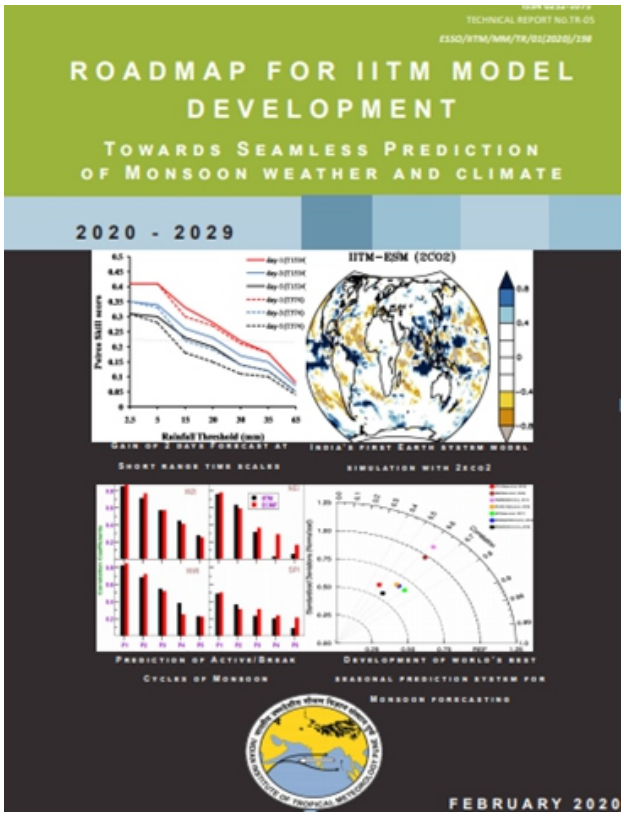
IITM News Letter
Quarterly e-Newsletter of Indian Institute of Tropical Meteorology
Volume 2 | Issue 3 | July 2020

ACHIEVEMENTS

- The first comprehensive climate change assessment report for India: The first national climate change assessment report entitled "Assessment of Climate Change over the Indian Region" edited by R. Krishnan, J. Sanjay, C. Gnanaseelan, M. Mujumdar, A. Kulkarni and S. Chakraborty was brought out by the Ministry of Earth Sciences, Government of India. This effort was led by the Centre for Climate Change Research (CCCR) at the Indian Institute of Tropical Meteorology (IITM), Pune. The report is published as an Open Access Book by Springer Nature, DOI:10.1007/978-981-15-4327-2 (online open access link https://link.springer.com/book/10.1007%2F978-981-15-4327-2).



- **Roadmap for IITM Model Development:** Towards Seamless Prediction of Monsoon Weather and Climate - 2020-2029: for the first time, Model development Group at IITM has come up with Roadmap document on IITM model development, published as IITM Technical Report. The primary goal of this roadmap is to develop a unified modelling framework for delivering seamless predictions of monsoon weather and climate. Read full report: https://www.tropmet.res.in/~lip/Publication/Technical-Reports/TR-5.pdf



- IITM contribution toward Predicting Super Cyclones: IITM has provided useful forecast guidance in terms of providing strike probability and cyclone track from GEFS based ensemble forecast system for Super Cyclone AMPHAN and Very Severe cyclonic Storm NISARGA. In both the cases, model forecast (ensemble mean track) shows much less error and accurate landfall location with longer lead time. This has helped in providing and managing the impact of tropical cyclone on coastal population.

- **Tropical cyclone "NISARGA":** The GEFS based cyclone tracker has successfully predicted the ensemble track, landfall and strike probability for very severe cyclonic storm "NISARGA" during 1-3 June 2020 with longer lead. The GEFS produced accurate track and land fall with lesser error in longer lead time for tropical cyclone "NISARGA".
- The GEFS based cyclone tracker has been operationalized during the episode of Super Cyclone "AMPHAN". The GEFS based cyclone track and strike probability were transferred to IMD. The GEFS produced accurate track and land fall with lesser error in longer lead time.

- Integrated Flood Warning System for Mumbai (IFLOWS-Mumbai): A state of the art Integrated Flood Warning System for Mumbai was launched by Shri Uddhavji Balasaheb Thackeray Honourable Chief Minister, Government of Maharashtra and Dr. Harsh Vardhan, Honourable Union Minister for Health & Family Welfare, Science & Technology and Earth Sciences, Government of India on 12 June 2020. IFLOWS Mumbai provides early warning for flooding specially during extreme rainfall events. It will provide three to six hour Nowcast as well as 72-hour early warning forecast. It will also monitor real-time weather change occurrences and provide timely warnings about the storm surges and rising tides; this information will also be used for assessing risks/risk management in the flood prone areas.

- The UAV laboratory "Lower Atmospheric Research using Unmanned Aerial System (LARUS) Facility" has been established with basic infrastructure at IITM, Pune. The instruments viz., Radiometers and Sky imagers at IITM, Pune and HACPL, Mahabaleshwar are being regularly operated and monitored online.

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 made available at the link: http://www.imdpune.gov.in/Clim_Pred_LRF_New/Models.html. IITM researchers provided necessary assistance to IMD scientists on this activity.

Extended Range Prediction

- The extended range prediction products for research/scientific use based on 5 days initial condition have been made available 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.

Global Forecast System for Short Range Forecast

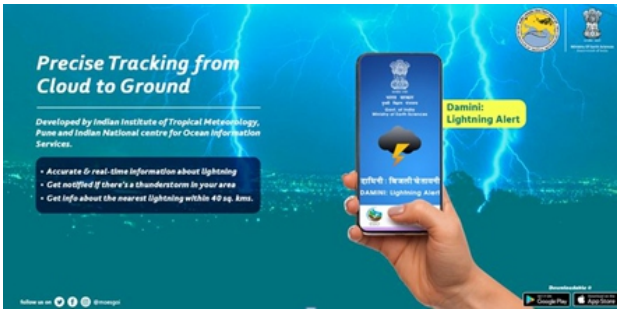
- The forecast based on Global Ensemble Forecast System (GEFS) T1534 and Global Forecast System (GFS) T1534 is being continued operationally by IMD. Global highest resolution (12 km) Ensemble Prediction System (EPS) with 21 ensemble members for short range forecast system based on GEFS (T1534) has been 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. GEFS probabilistic forecast based on 1200UTC initial condition has been initiated.
- 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.

National Facility for Airborne Research (NFAR)

- The UAV laboratory named as "Lower Atmospheric Research using Unmanned Aerial System (LARUS) Facility" has been established with basic infrastructure at IITM.
- The instruments such as Radiometers and Sky imagers at IITM, Pune and HACPL, Mahabaleshwar are being regularly operated and monitored online through team viewer and the issues which aroused during this month were attempted through online procedures. Hence, data continuity is maintained and data is also downloaded from time to time. The data is also being calibrated and processed online.

Thunderstorm Dynamics

- As advised by the Parliament Standing Committee, i-phone version of Mobile App for lightning alert -DAMINI LIGHTNING ALERT is released on 31st May 2020. The App is now available on iPhone apps store for download. A total of 75 sensors of Lightning Location Network are installed across the country.



CAIPEEX Phase-IV Solapur and Tuljapur Sites

- Solapur and Tuljapur observations are continued as it is a requirement to have long term observations over the cloud seeding study area. Solapur and Tuljapur sites are operational during the lockdown with minimum instrumentation. Presently, the CAIPEEX observational centre at Solapur Engineering College is serving as a quarantine centre for the COVID-19 patients, thus, several instruments in the laboratory have been shut down due to the lock down conditions.
- However, IITM CAIPEEX team is remotely monitoring remaining instruments that are continuously running and collecting valuable data viz., wind profiler, radiometer and tower based measurements of meteorological parameters, ceilometer, etc. during the lock down period. Due to unavailability of CMC, radar at Solapur is not operational.

Field Campaigns

- Online monitoring of instrument performance, data acquisition & trouble shooting: The instruments such as Radiometers and Sky imagers being operated regularly at IITM, Pune and HACPL, Mahabaleshwar are regularly monitored online through team viewer and the issues which aroused during this month were attempted through online procedures. Hence data continuity is maintained. The data is also being calibrated and processed regularly.
- Twilight Photometer observations: Twilight Photometer, which is indigenously designed and developed at IITM for aerosol observations, is operated at IITM during evening twilight period (after sunset) for the period 5-28 May under clear sky conditions. The data is being processed for aerosol vertical profiles.
- The first national climate change assessment report: Ministry of Earth Sciences, Government of India has brought out the First national climate change assessment report entitled "Assessment of Climate Change over the Indian Region" edited by R. Krishnan, J. Sanjay, C. Gnanaseelan, M. Mujumdar, A. Kulkarni and S. Chakraborty, at IITM Pune. This effort was led by the Centre for Climate Change Research (CCCR) at the Indian Institute of Tropical Meteorology (IITM), Pune. The report is published as an Open Access Book by Springer Nature, DOI:10.1007/978-981-15-4327-2 (online open access link https://link.springer.com/book/10.1007%2F978-981-15-4327-2)
  This book discusses the impact of human-induced global climate change on the regional climate and monsoons of the Indian subcontinent, adjoining Indian Ocean and the Himalayas. It documents the regional climate change projections based on the climate models used in the IPCC Fifth Assessment Report (AR5) and climate change modeling studies using the IITM Earth System Model (ESM) and CORDEX South Asia datasets. This book also presents policy relevant information based on robust scientific analysis and assessments of the observed and projected future climate change over the Indian region.

RESEARCH HIGHLIGHTS:

- IITM is continuously working on operational Seasonal forecast runs, Extended range prediction products (ERPAS) for research/scientific use, Global forecast system for short range forecast, System for thunderstorm observation, prediction and monitoring (STORM), Air quality early warning system for Delhi NCR, Air quality forecast for SAFAR cities, etc. even during the Covid-19 lockdown period. All the products/information are being continuously made available to researchers and the public for wider dissemination through various platforms such as dedicated websites, mobile Apps, SAFAR LED display boards, and IITM social media platforms. Continuous ground

based observations are also being carried out under various on-going projects such as CAIPEEX, HACPL, SAFAR, etc. during this period. The impact of reduced emissions during the lockdown period on air quality in terms of reductions in various pollutants in 4 SAFAR cities and its simulation by WRFChem has been studied and made available at: http://safar.tropmet.res.in/. Some preliminary analysis using CAIPEEX, Solapur data has been carried out. JRF 2nd semester classes are being conducted online. IITM has participated in all important meetings through various online systems such as Jitsi, Microsoft Teams and Skype.

Ongoing Developmental Activities

System for Air Quality & Weather Forecast & Research (SAFAR):

- Source apportionment of PM2.5 at 4 locations in Delhi using field observations of chemical speciation (Ions, OC, EC and metals) in winter 2018-19 (Dec-Feb) has been studied and the results are being compared with other emission inventories in literature to identify specific relatively dominant source at each location. Spatial distribution of PM2.5 to identify daily hotspots is being made available in SAFAR website.
- The impact of reduced emissions during the lockdown period on air quality in terms of reductions in various pollutants in 4 SAFAR cities and its simulation by WRFChem have been studied. Similarly, the impact on aerosol profiles in Delhi and its optical characteristics (AOD) is being studied and interpreted from the perspective of corresponding variability in solar radiation, cloud cover, air temperature, mixing layer height and precipitation.
- The impact BC on Himalayan glaciers and BC radiation forcing has been found to be dependent on BC deposition in snow as well as its magnitude in atmosphere.
- Mortality rate due to Covid19 is related to co-morbid condition which in turn is dependent on background air quality. Statistical analysis of spatial variability in Covid19-related deaths and air quality is being studied using data in Ahmedabad.
- Continuous observations on highly absorbing carbonaceous aerosols *i.e.,* black carbon (BC) particles are being carried out at Solapur and Tuljapur under CAIPEEX ground observational campaign. Due to lock down constraints, data from Solapur site could only be recovered till 14 April 2020. However, preliminary analysis of Solapur data revealed that: a)16% reduction in BC mass concentration during post lock down period as compared to the pre lock down period; b) on Janata Curfew day, 28% reduction in BC mass concentration observed as compared to the mean of preceding days in March 2020; c) 12% increase in biomass burning fraction of BC during post lock down period as compared to the mean of preceding days in March 2020; d) biomass burning fraction of BC on Janata Curfew day was 5 % more; e) overall, there was reduction in vehicular emissions (fossil fuel burning) but biomass burning mainly for household purposes persisted without significant impact of lockdown.

- Diurnal and seasonal variation of cloud fraction: Cloud fraction (CF) retrieved from a ground-based Whole Sky Imager (WSI) play a crucial role in validating satellite data and numerical models. WSI using a thermal infrared (TIR) camera is operated at a high altitude station located in the Western Ghats (WG) of the peninsular India during December 2016 to May 2019. CF is retrieved continuously for 24 hours at a high temporal resolution (5 minutes) and a unique time series is constructed for thick, thin and total cloud cover. Data is processed for diurnal, monthly and seasonal variation.
- The instruments such as Radiometers and Sky imagers being operated regularly at IITM, Pune and HACPL, Mahabaleshwar are regularly monitored online through team viewer and the issues which arised during this month were attempted through online procedures. Hence data continuity is maintained. The data is also being calibrated and processed regularly.
- The raindrop size distribution measurements collected at Santacruz in Mumbai and Mahabaleshwar using impact type disdrometers yielded detailed insights on microphysics of precipitation during Nisarga Cyclone.

EVENTS & ACTIVITIES:

India UK Water Centre (IUKWC)

- IUKWC is launching its own webinar series for showcasing their outstanding contributions that is being carried out by Indian and UK scientists in the area of water for wide dissemination.

Applications are invited from the wider water research communities to propose talks for the webinar.

- **MoES Webinar Series:** DESK with the help of Computer Division and Library, Information and Publication Division organized a series of Live Talks on "Earth Sciences Popular Lectures", in coordination with MoES & its Institution. These talks are available on IITM YouTube channel.
  - **Dr. Atmanand,** Director, NIOT, Oceans- the give and take, 8 May 2020, https://youtu.be/zxu176d2x2Y
  - **Dr. Gufran Beig,** Scientist G, IITM Pune, Air Pollution and Covid-19, 12 May 2020, http://youtu.be/9AtLnKdyBF8
  - **Dr. S.C. Shenoi,** Director, INCOIS, Hyderabad, Tsunami- Basics and Warning System, 14 May 2020, http://youtu.be/J5X61CbTd-g
  - **Dr R Venkatesan**, Head- OOS Group, NIOT, Chennai, Sustaining the Ocean Observations, 19 May 2020, https://youtu.be/j2v_FcVd86Q
  - **Prof. Ravi S. Nanjundiah**, Director, Indian Institute of Tropical Meteorology, Pune, Basics of Monsoon, 21 May 2020, https://youtu.be/NlYRiVz8qA0
  - **Dr. G A Ramadass**, Scientist G, Head, Deep Sea Technologies Group, NIOT, Technology Development for the exploration and harvesting of deep ocean minerals, 26 May 2020, https://youtu.be/ZERaHzHatNk
  - **Dr. Thamban Meloth**, Scientist – F & Group Director (Polar Sciences), NCPOR, Himalayan glaciers in a changing climate, 28 May 2020, https://youtu.be/ol5kqI2CdLc
  - **Dr. Rahul Mohan,** Scientist F and Group Director (International Cooperation and Outreach), NCPOR, Antarctica- Past and Present, 2 June 2020, https://youtu.be/t5ZnAQNPL3E
  - **Dr. G. Pandithurai,** Scientist-F and Project Director, IITM, Cloud Physics: How Clouds Form, 4 June 2020, https://youtu.be/sfZAIKEnzdM
  - **Dr. M.V. Ramana Murthy,** Director NCCR, Director in-charge CMLRE, Project Director NIOT, Enhancing Resilience to Erosion and Flooding in Coastal Areas, 9 June 2020, https://youtu.be/DS4BEjkZ9vM,
  - **Dr. Somenath Dutta**, Scientist -F, IMD, Basics of Weather Forecasting Including Observation, 11 June 2020, https://youtu.be/S5LXq2j48kk
  - **Dr. Mrutyunjay Mohapatra**, Director General of Meteorology, IMD, Tropical Cyclone-Basics Dynamics and Prediction, 16 June 2020, https://youtu.be/Rfk1GyQW2nE,
  - **Dr. V. Nandakumar**, Director, NCESS, Geoscience-Basics, 18 June 2020, https://youtu.be/N6jexqtX2Ls,
  - **Dr. C. Gnanaseelan**, Scientist-F & Project Director (Short Term Climate Variability & Prediction), IITM, Monsoon Variability, Teleconnection and Prediction, 23 June 2020, https://youtu.be/vYItvR4PfMs,
  - **Dr. Thara Prabhakaran,** Scientist F and Project Director CAIPEEX, IITM, Physics of Precipitation, How rain occurs, 25 June 2020, https://youtu.be/8Ua4B0xMJuQ,
  - **Dr. Soma Sen Roy**, Scientist F, India Meteorological Department, MoES, Thunderstorms, Dust storms and Lightning, 30 June 2020, https://youtu.be/Oc2iGnUpDrI,

IITM Monsoon Discussion Forum (IMDF) 2020

- The First IITM Monsoon discussion seminar with a focus on "Onset and LRF of monsoon 2020" was organised on 16 June 2020 with the following talks by IITM Scientists https://youtu.be/2EMhGEuMG7k
  - Dr. C. Gnanaseelan, Oceanic Conditions
  - Dr. Suryachandra A. Rao, Seasonal Prediction
  - Dr. A.K. Sahai, Extended Range Prediction
  - Dr. P. Mukhopadhyay, Short Range Prediction.

Important Events

- IITM-ENVIS World Environment Day-2020 Open Competitions: The MoEF&CC's ENVIS Resource partner on "Atmospheric Pollution & Climate Change" at IITM organized various online competitions on the occasion of World Environment Day–2020 to

spread awareness on various pressing environmental and climate issues to minimize any expenditure under current pandemic situation. Online entries are to increase reachout maximum students and boost creativity through online participation. Winners would be awarded with attractive prizes and certificate from ENVIS-MoEF&CC.

- Open online competitions on Drawing, Slogan and Essay; got an overwhelming response from various parts of the country. It is observed that the students are keen to understand and wondering about the effect of 'COVID-19 and the Air that they are breathing'. The names of the winners of competitions were announced during the talk. https://youtu.be/3hyF8ufbdj0
- World Environment Day: On the occasion of World Environment Day 2020, 2 live talks were delivered on 5 June 2020:
- IMS Webinar by Dr. M. Rajeevan, Secretary, MoES on the topic "COVID-19 and Meteorology", which covered following two aspects: (i) Changes in the Environment due to COVID-19 lockdown, and (ii) The impact of lockdown on meteorological observations and forecasts. https://youtu.be/E7czw1KVMfs
- A talk by Dr. Gufran Beig, Sc-G and ENVIS-IITM Coordinator entitled "COVID-19 and Air you breathe: Positivity of Mind".

ACADEMIC ACTIVITIES:

Program for Development of Skilled manpower in Earth System Sciences (DESK)

- Advertisement for inviting online applications for the MoES Research Fellow Program (MRFP), Research Associates and Research Fellows for the academic year 2020-21 has been uploaded on IITM website. Applications are being invited till 31st July 2020.
- Online Classes for II-semester for IITM Research Fellows are being arranged using Jitsi – an open source platform.

IITM PARTICIATION IN IMPORTANT MEETINGS:

- E-meeting for the OceanX Indian Ocean Expedition Discussion, organized by NOAA and OceanX, 14 April 2020.
- ICMPO telecon for the CLIVAR/GEWEX Global Monsoons Panel (GMP) meeting, 16 April 2020.
- E-meeting with the Global Oceans on employing an Atmospheric Instrumentation Suite (AIS) in the Indian Ocean, 21 April 2020.
- The Ministry of Environment, Forest and Climate Change since 2017 is implementing the National Carbonaceous Aerosols Programme - Carbonaceous aerosol emissions, source apportionment and climate impacts (NCAP-COALESCE) project under the Climate Change Action Plan through a network of 17 leading national research institutions. In this connection an online review meeting was organised on 25th April 2020. IITM Scientists involved in this program participated in the online meeting with MoEFCC and implementing agencies for the review of progress of this project and to provide further guidance.
- Meeting with ICCP commission regarding decision on ICCP conference, 7th April 2020
- IITM scientists attended: i) number of Lock Down Live Talk Series arranged by Vijnana Bharati & ii) Web Of Science Training programs which were conducted for all MoES Institutes in association with Clarivate.
- "Earth Sciences Popular Lectures" webinar series organized by IITM in coordination with MoES& its Institutions during Covid19 pandemic.
- European Geosciences Union (EGU) General Assembly 2020, during 4-8 May 2020 led by Dr. Matthias Mauder, Karlsruhe Institute of Technology, Germany.
- Virtual meeting "WCSSP-India IND4 STIMULATE", organized by University of Reading, UK and Met Office, UK during 14-15 May 2020.
- CLIVAR/GEWEX Monsoons Panel Teleconference on 21 May 2020 for discussion between Co-Chairs & members of Monsoons Panel (MP), ICMPO (at IITM Pune) India & ICPO China.
- MoES KRCNet Meetings: Library, Information and Publication Division (IITM) participated in Stakeholders meetings and attended 4 days DSpace online training programs conducted by Informatics.
- IPCC Sixth Assessment Report Pre-LAM meeting, 1-5 June 2020.
- WMO-Expert team meeting of weather modification, 16 June 2020 through Webex.
- CLIVAR/GEWEX Monsoons Panel

Teleconference, 23 June 2020.

- Fulbright webinar (virtual session) by United States-India Educational Foundation (USIEF) on "The Oceans and the Monsoon", 25 June 2020.
- WCRP CORDEX Science Advisory Team (SAT) meetings, 25 and 30 June 2020.
- Meeting hosted by the CORDEX international project office (IPOC) with the ICIMOD-ARRCC (UKMO)-IITM training workshop organisers, 26 June 2020.
- CORDEX Flagship Pilot Study (FPS) Convection Permitting Third Pole (CPTP) 2nd modeling working group meeting, 29 June 2020.

AWARDS AND HONERS:

- Dr. G. Beig, as an Eminent Speaker addressed at the Plenary session 9: 'Climate Change, Poverty & Pandemic: Is it time to recalibrate SDGs?', during "4-day International Conference (online) of 'Eradication of Biological and Chemical Weapon', organized by Maharashtra Institute of Technology World Peace University (MIT-WPU), Pune on 26 June 2020.
- Dr. Devendraa Siingh has been recognized as Ph.D. guide in Physics by Hemvati Nandan Bahuguna Garhwal University (A Central University), Srinagar (Garhwal), Uttarakhand.
- Dr. Yogesh K. Tiwari nominated for the Integrated Global Greenhouse Gas Information System (IG3IS) Steering Committee by WMO-Environmental Pollution and Atmospheric Chemistry Scientific Steering Committee (EPAC-SSC). Initial period of appointment is for 2 years.
- Dr. Roxy Mathew Koll is appointed as an Associate Editor for the journals: 'Progress in Oceanography' and 'Frontiers in Climate';
  He chaired the CLIVAR/IOC/GOOS Indian Ocean Region Panel, and participated e-meeting with the Global Oceans on employing an Atmospheric Instrumentation Suite (AIS) in the Indian Ocean on 21 April 2020.
- Mr. Subharthi Chowdhuri's work "Persistence analysis of velocity and temperature fluctuations in convective surface layer turbulence" is selected as a featured article in the journal "Physics of Fluids".

PHD AWARDS:

- Ms. Ananya Karmakar was awarded Ph.D. degree from Savitribai Phule Pune University (SPPU) in June 2020 for her thesis entitled "Study of the Role of Physics and Resolution on the Interannual variability of Indo-Pacific Ocean Using Ocean Model" under the guidance of Dr. Anant Parekh and Dr. C. Gnanaseelan.
- Mr. Sudarsan Bera was awarded Ph.D. degree from Savitribai Phule Pune University (SPPU) in June 2020 for his thesis entitled "Investigation of Entrainment and Mixing Processes in Convective Clouds Using Observations and Numerical Simulation" under the guidance of Dr. Thara Prabhakaran and Dr. G. Pandithurai and Dr. Bipin Kumar (Co-Guide)

(Ms. Ananya Karmakar)

(Mr. Sudarsan Bera)

OTHER ACTIVITIES

IITM participation in the following events/webinar:

- International Day of Yoga (IDY) – 2020 arranged by Ministry of AYUSH, Government of India on 21 June 2020 (online).
- Library, Information and Publications Division conducted User Education sessions in association with MoES & published service provider for the library user on:

1.Magzter (online magazine access platform) : subscribed by MoES under DERCON Consortium.

2.Web of science training program (1 Month).

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150 YEARS OF CELEBRATING THE MAHATMA

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