

Ministry of Earth Sciences (MoES)
Summary of Important Developments –October, 2016

1. **Important policy decisions taken and major achievements during the month:** Provided in Annex I.

2. **Important policy aspects / matters held up on account of prolonged Inter- Ministerial consultations/ delays, etc.:** Nil

3. **Compliance of COS decisions:**

S.No.	Number of COS decisions pending for compliance	Proposed action plan/timelines	Remarks
1.	<p>Dt 14/08/2014 PROPOSAL FOR KRILL FISHING</p> <p>MoES, in collaboration with MEA, will study the experience of different countries showing varied interest in krill fishing so that India could learn from their experiences. MEA, in collaboration with MoES, will examine and identify the countries with which India can collaborate for krill fishing. MoES will ascertain the interest of Indian industry in krill fishing and also explore the feasibility of Indian companies collaborating directly with foreign companies. MoES will study legislations enacted by other member countries before finalising the draft legislation as part of international convention obligations.</p> <p>MoES will bring out a paper on krill fishing giving a detailed account of demand analysis, financial viability, interest of industry, experiences of other countries, criteria for fishing license, existing knowledge gap, etc. Thereafter, the CoS will meet again to decide whether India should engage in commercial krill fishing.</p>	<p>The Ministry has examined the aspect of Krill fishing. Japan & Norway have developed expertise and these countries have been tentatively identified for collaboration on Krill fishing. Their experiences have been obtained. Indian Industries have been approached for Krill fishing to ascertain their interests. However, so far we have not received any response. The draft paper is prepared and suggestions of Cabinet Secretariat have been obtained.</p>	<p>There is no response from the private industries for a long time. Accordingly, it is proposed to close this item for monthly reporting. As and when the response is received, the same will be reported.</p>

4. **Cases of sanction for prosecution pending in the Ministry for more than three months:** Nil

5. **Particulars of cases in which there has been a departure from the Transaction of Business rules of established policy of the Government:** Nil

6. **Status of implementation of e-Governance :** Under process/ being implemented

7. **Status of Public grievances:**

No. Of Public Grievances redressed during the month	No. Of Public Grievances pending at the end of the month
19	40

8. **Information on the specific steps taken by the Ministry/Department for utilization of the of the Space Technology based tools and applications in Governance and Development:** Potential Fishing Zone advisories are generated using the satellite derived parameters viz. Sea Surface Temperature, and Chlorophyll. Further, data from Global satellite data are used on continuous basis for generating short range and medium range weather forecasts.

Annex-I

Important policy decision taken and major achievements:

A high altitude research station in Himalaya called HIMANSH, was set up at a remote region in Spiti, Himachal Pradesh situated above 13,500 ft (> 4000 m). "Himansh" equipped with various scientific instruments to quantify the glacier melting and its relation to changing climate, is expected to provide the much needed fillip to the scientific research on Himalayan glaciers and its hydrological contribution with specific focus on upper Indus basin (Chandra basin).

Virtual India-UK Joint Centre on Water Security has been launched. This centre, hosted by the Indian Institute of Tropical Meteorology, Ministry of Earth Sciences, Pune, builds on recent and ongoing collaborative water research programmes between India and the UK.

The website for high resolution short range deterministic weather forecasts with 12 km horizontal resolution has been launched at Indian Institute of Tropical Meteorology (IITM), Pune.

Southwest monsoon has withdrawn from the entire Country on 28th October 2016 against the normal date of 20th October.

Northeast Monsoon rains have commenced over southeast peninsular India on 30th October 2016 against the normal date of 20th October.

Minimum Government, Maximum Governance:

Agromet Advisories are being communicated to 254 lakh farmers of the country through mobile SMS.

Adverse weather SMS warning are being sent through mobiles to State Govt. officials / Disaster related officials /Central Govt. Organization/Common men.

Daily forecast along with warning and city forecast for many cities are disseminated through email to all users including state authorities, electronic and print Medias.

High Performance Computing network was established between Indian Institute of Tropical Meteorology(IITM), Pune and National Centre for Antarctic and Ocean Research(NCAOR), Goa with help of National Knowledge Network (NKN) closed user group (CUG) for running sea-ice modeling at NCAOR, Goa.

NCAOR website was enhanced for displaying last 24 hours details of weather details at Bharati and Maitri stations in Antarctica.

National Polar Data Centre (NPDC) was strengthened with past data and the portal was enhanced for accessing and downloading the processed data by the registered and non- registered users.

Atmospheric Observation Systems Network

Observation Type	Target	Commissioned up to October, 2016	Data reporting
Automatic Weather Station (AWS)	675	682	373
Automatic Rain Gauge(ARG)	1350	1341	471
GPS Sonde	10	43	43
Doppler Weather Radar(DWR)	23	20	20
Ozone	17	15	5
Black Carbon Monitoring Systems (Aethalometer)	16	16	16
Other Rain Gauges excluding ARG and AWS @	-	-	2456
Aviation	--	72	72
Agro-meteorology	267	264	160

@ Data received from various agencies viz. Air Force, Railways, Central Water Commission, State Agriculture, State Irrigation and ESSO-India Meteorological Department (IMD)

Atmospheric Processes, Modeling and Services

Monthly Weather Summary (October, 2016):

Cyclonic storm, Kyant over Bay of Bengal (21-28 Oct. 2016): The Cyclonic Storm (CS) Kyant developed on 21st October with the formation of a depression (D) over eastcentral Bay of Bengal (BOB). Initially, it moved east-northeastwards towards Myanmar coast and steadily intensified into a deep depression (DD) on 23rd morning. Thereafter, it changed its direction of movement and recurved west-northwestwards. It intensified into a CS in the morning of 25th over eastcentral BOB. Thereafter, it again changed its direction of movement and moved west-southwestwards towards westcentral BOB off Andhra Pradesh coast. It maintained its intensity till midnight of 26th and thereafter weakened gradually becoming DD in the early hours 27th and D in the same evening. It weakened into a well marked low pressure area over westcentral BOB off Andhra Pradesh coast in the morning of 28th.

Heavy Rainfall: One Hundred Fifteen (115) and Twenty Seven (27) heavy rainfall & very heavy rainfall events occurred over different meteorological subdivisions of India during October 2016. The forecast performance in term of skill scores for these events is given in following Table:

	Rainfall Forecast(Percent correct)		
	Heavy Rainfall (64.5 to 115.5 mm)	Very Heavy Rainfall (> 115 mm)	Heavy/ Very Heavy Rainfall (≥ 64.5 mm)
24 Hour	91	97	91
48 Hour	90	97	90
72 Hour	90	97	90

Rainfall in October, 2016

Rainfall during the month of October, 2016 was excess in 7, normal in 7, and deficient/scanty in 22 of 36 meteorological sub- divisions. The rainfall for the country as a whole for the month has been recorded as 53.9 mm (-33%) against the normal rainfall for the month as 80.9 mm.

The rainfall distribution in spatial and temporal terms was overall conducive for the growth of crops except some heavy rainfall incidences in Marathwada, North Interior Karnataka and Gujarat. Heavy rainfall during 30th September to 4th October damaged soybean crop at harvesting stage in Beed (in 2 lakh ha), Osmanabad (2.5 lakh ha) and Latur (1000 ha) districts. Also damage in cotton, moong and arhar is also reported. In North Interior Karnataka, heavy rains during first week of October caused crop damage (red gram, cotton, soybean) in Bidar and Kalaburgi districts. Also harvesting of pulses and rice in Valsad and Navsari districts, bajra, maize, sesame and green gram and cowpea in North Gujarat Zone and harvesting of bajra, green gram, cowpea and sesame in Kutch district were affected due to heavy rains during the first week of October.

Atmospheric Research

Forecast Demonstration Project on cyclones (FDP) over Bay of Bengal(BOB) commenced from 15th October. Everyday a report by National Operation Centre is being issued on the state of atmosphere & sea over north Indian Ocean with respect to possible cyclogenesis and further movement and intensification. It will continue till 30th November 2016.

A special Balloonsonde campaign for measurements of water vapor, aerosol back scatter, ozone and relative humidity in the upper troposphere and lower stratosphere was conducted at Nainital in Uttarakhand during 23 July to 31 August 2016 by IITM scientists in collaboration with ETH Zurich (Swiss Federal Institute of Technology in Zurich), Switzerland as a part on Indo-German project.

Monsoon Weather Reports, Maps and Crop Yield Forecast

The End of the Season Report on Southwest Monsoon 2016 was prepared and circulated to all concerned during 1st week of October 2016.

Daily All India Weather Summary and Weekly Weather Reports are being brought out on routine basis. Four (4) weekly and cumulative Standardized Precipitation Index (SPI) maps were prepared for the weeks ending 5th, 12th, 19th & 26th October 2016 and supplied for use in Agromet. Advisory Services Bulletin.

Four (4) Drought Outlook Maps based on Aridity Anomaly Index for drought monitoring for the weeks ending 7th, 14th, 21st & 28th October and four(4) Weekly Aridity Anomaly maps & reports were prepared for the week ending 30th Sep.; 7th, 14th & 21st Oct. 2016 uploaded on IMD Pune website.

Two (2) biweekly aridity maps and reports for the period 14th Sept. to 7th Oct. & 8th to 21st Oct. has been prepared.

Climate Diagnostics Bulletin of India for August 2016 was brought out.

Standard Precipitation Index (SPI) Statistics for the month of Sept. 2016 and South West Monsoon season 2016 has been prepared and uploaded in IMD Pune Website.

Geoscience Research

Seismological Observational Network

Observation Type	Target for XII Plan	Commissioned so far	Data reporting during the month
Seismic stations	130	99	66
GPS stations	40	28	22

Earthquake and Tsunami monitoring

Earthquake: 22 earthquakes were monitored in the Indian region out of which 2 events were greater than magnitude (M) of 5.0.

Tsunami: 1 major seabed earthquake(M> 6) with a potential to generate tsunami were monitored. This information was provided within 12 minutes of occurrence of the event.

Ocean Observation System

Type of Platform	Target	Commissioned till October, 2016	Data received during October, 2016
Argo Floats	200	283	134
Drifters	150	98	11
Moored Buoys	16	19	18
Tide Gauges	36	30	19
High Frequency(HF) Radars	10	10	8
Current Meter Array	10	11	5
Acoustic Doppler Current Profiler(ADCP)	20	21	18
Tsunami Buoys	7	9	6
Wave Rider Buoy	16	15	15

*The remaining floats/drifters have completed their life time and as such no data can be received from them.

Ocean Science Services

No	Types of forecasts	No. of advisories issued during the month
1	Integrated Potential Fishing Zone (PFZ) advisories (Sea Surface Temperature(SST), Chlorophyll., wind)	30
2	Tuna Fishing Advisories	30
2	Ocean State Forecast(OSF)-Wave, Wind, Currents, SST, MLD and D20 forecasts	30
3.	Near Real time global ocean analysis (5-day averaged)	6
4.	Real time global ocean analysis (daily)	31
5.	Coral Bleaching Alert System	10

Swath Bathymetric Survey of Exclusive Economic Zone

An area of 21,500 sq km was surveyed with acquisition of bathymetric data.

Polar Science and Expedition

Monitoring of installed stakes over Sutri Dhaka, Batal, Samudra Tapu, Gepang Gath, Kunzam and Bara Shigri glaciers was carried out along with the monitoring of hydrological stations along the Chandra River in Himalayas.

A newly sanctioned Indo-Norwegian project called Mass balance, dynamics, and climate of the Dronning Maud Land coast, East Antarctica (MADICE) is being initiated. This will involve geophysical field measurements, ice core drilling, ice sheet modeling and satellite remote sensing based study.

Changes in ice shelf positions of the Amery ice shelf (AIS), Eastern Antarctica, are investigated for a period of 15-years (2001-2016) using multi-dated MODIS satellite images. Past coastline positions have been demarcated and future positions are estimated for 5- and 10-year period.

The study of vertical profiles of temperature and salinity data from 2010 to 2015 in the Indian Ocean sector of the Southern Ocean during austral summer indicated that heat flux could be the causative factors for the shallow – Mixed Layer Depth (MLD) at Subtropical front, whereas, the deep MLD occurred at Polar Front is attributed to high wind speed. The effect of MLD variation was reflected on the nutrients and thus on the phytoplankton community structure in the study regions.

Capacity Building and Outreach

Workshop of World Meteorological Organisation(WMO) on “Enhancing Climate Indices for Sector-specific Applications in South Asia region” was held at IITM Pune during 3–7 October 2016. This workshop was organized under the guidance of the Expert Team on Sector-specific Climate Indices (ET-SCI) and as a part of the Canada-funded programme on the implementation of the Global Framework for Climate Services (GFCS) at the regional and national scales. The Workshop was aimed at enhancing the use of climate information in climate-sensitive sectors for climate risk management and adaptation, through interdisciplinary analysis and interpretation of sector-specific climate indices. The workshop brought together experts from priority areas (agriculture and food security, water health energy and disaster risk reduction) from nine South Asian countries including India.

Indo-Bangladesh Scoping Workshop on 'Maritime Cooperation and Blue Economy' was hosted during 3 - 4 October 2016. 12 delegates from Bangladesh and 1 delegates from India participated in the workshop.

An International Winter School on "Operational Oceanography: Indian Ocean Circulation and Sea Level Variation" was organised during October 16 - 21, 2016 at International Training Centre for Operational Oceanography, in INCOIS, Hyderabad together with Nansen Scientific Society, Nansen Environmental and Remote Sensing Centre (NERSC), Norway and Nansen Environmental Research Centre India (NERCI), Kochi, India. 36 young researchers from India, Norway, Cameroon, South Africa, Bangladesh, Sri Lanka and Portugal participated in the winter school that had faculty from NERSC (Norway), NERCI (India), Centre for Theoretical Sciences, (Bangalore), National Institute of Oceanography (Goa) and INCOIS.

'Stakeholders Meeting on Dissemination Strategy for Marine and Weather services of MOES' was held on 27 September 2016 at Indian National Centre for Ocean Information Service (INCOIS). Hundred officials from various coastal states and agencies working in meteorological and marine forecasting related fields attended the meeting.

IMD in collaboration with Mahatma Phule Krishi Vidyapeeth (MPKV),Pune organized training on “Crop Yield Forecast using statistical and crop growth simulation models” for Senior Research Fellows (SRF) at College of Agriculture, Pune, Maharashtra during 18-21st October 2016. Around 20 SRF participated in the training.

“First National Workshop on Ballast Water Management (NWBM 2016)”, was conducted at National Institute of Ocean Technology(NIOT), Chennai, on 7th October, 2016 and participants from various organizations attended the workshop.

A National workshop on Passive acoustic sensors, measurements and calibration was conducted on 14th October, 2016 at NIOT and researchers and scientists from various organizations such as Navy, Fisheries, IIT and NIO participated.

“National Conference on Recent Trends in Biotechnology (BioTrends-2016)”, jointly with Society for Biotechnologists India (SBTI), “ was conducted at NIOT Chennai, during 19- to 21, October, 2016 and more than 100 participants including research scholars, faculty and scientists from different organizations attended the workshop.

Parliamentary Sub-Committee for Official Language inspected the Regional Meteorological Centre, Kolkata.

Utilization of Ocean Research Vessels during the month

Vessel	Days at Sea / Utilization	Maintenance/ Inspection /Scientific Logistics / Cruise Preparation	No. of Cruise	No. of Port Calls / Port Stay/ Statutory survey
Sagar Nidhi	16	15	3	-
Sagar Manjusha	0	31(Dry Dock)	0	0
Sagar Purvi	0	31(Dry dock)	0	0
Sagar Kanya	21	11	1	-
Sagar Sampada	28	2	1	1

Publications in Science Citation Index(SCI) journals and PhDs awarded

Subject	Publications			Ph.Ds		
	April-September,2016	October, 2016	Total	April-September,2016	October, 2016	Total
Atmospheric Sciences	99	10	109	1	2	3
Ocean Science and Technology	33	2	35	1	-	1
Polar Sciences	21	3	24	-	-	-
Geosciences and resources	7	-	7	-	-	-
Total	160	15	175	2	2	4