

Ministry of Earth Sciences (MoES)
Summary of Important Developments –April, 2017

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
33	22

8. **Information on the specific steps taken by the Ministry/Department for utilization 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 forecast, and climate forecasting.

Annex-I

Important policy decision taken and major achievements:

1. **The first stage forecast for 2017 South-west monsoon** (June to September) rainfall for the country as a whole indicates that the monsoon seasonal rainfall is likely to be 96% of the Long Period Average (LPA) with an error of $\pm 5\%$.
2. **Consensus forecast for the 2017 southwest monsoon season** (June to September) Rainfall over South Asia issued in 10th Session of the South Asian Climate Outlook Forum (SASCOF-10) during 24-26 April 2017 at Thimpu, Bhutan indicates that normal rainfall is most likely during the 2017 southwest monsoon season (June –September) over much of South Asia. More specifically, below-normal rainfall is most likely over broad areas of north-western, central and south-eastern parts of South Asia., above-normal rainfall over broad areas of eastern and the south-western parts of the region and normal rainfall over the remaining areas.
3. **Seasonal Outlook update** indicates that during the 2017 Hot Weather Season (April to June), warmer than normal temperatures are likely in all meteorological sub - divisions (except Sub Himalayan West Bengal and Sikkim) of the country. Seasonal (April -June) average temperatures over many of the subdivisions from northwest and neighbouring central India are likely to be above normal by more than 1.0°C. Normal to above normal heat wave (HW) conditions are likely over core heat wave zone of the country.
4. **6-hourly weather expedition forecast** including wind, temperature and precipitation forecast for next 24 hours and outlook for subsequent 24 hours for Mount Everest and Dhaulagiri was introduced.
5. A Foundation Stone for the Marine Finfish Hatchery and Test Facility for Ballast Water Treatment Technologies was laid on April 8, 2017 by Shri Y.S. Chowdary, Honourable Minister for State for Science & Technology and Earth Sciences at Nellore sea front. These facilities will be developed by National Institute of Ocean Technology, an autonomous institute under Ministry of Earth Sciences.
6. A half yearly review of all programmes of the Ministry and its attached offices/subordinate office/institutes was carried out.

Minimum Government, Maximum Governance:

Agromet Advisories are being communicated to 214 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 media.

Atmospheric Observation Systems Network

Observation Type	Target	Commissioned up to April, 2017	Data reporting
Automatic Weather Station (AWS)	675	682	369
Automatic Rain Gauge(ARG)	1350	1350	561
GPS Sonde	10	43	43
Doppler Weather Radar(DWR)	23	20	19
Ozone	17	15	5
Black Carbon Monitoring Systems (Aethalometer)	16	16	16
Other Rain Gauges excluding ARG and AWS @	-	-	2370
Aviation	--	73	73

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

Atmospheric Processes, Modeling and Services

Monthly Weather Summary (April, 2017)

Cyclonic Storm Maarutha : A depression (D) developed over southeast Bay of Bengal (BOB) in the morning of 15th April. Moving northeastwards, it intensified into a deep depression (DD) over eastcentral BOB in the afternoon of 15th and into a cyclonic storm (CS) **Maarutha** over eastcentral BOB in the midnight of 15th. Moving northeastwards, it reached its peak intensity in the early hours of 16th. The peak maximum sustained surface wind speed (MSW) of the cyclone was 70-80 kmph gusting to 90 kmph. The system crossed Myanmar coast near Sandoway (Thandwe) in the midnight of 16th. After landfall, the system continued to move northeastwards and weakened gradually. The cyclone was monitored & predicted continuously and India Meteorological Department (IMD) issued regular bulletins to Bangladesh, Myanmar and Thailand, National & State Disaster Management Agencies, general public and media since inception of the system over BOB.

Western Disturbance: Five (5) Western Disturbances (WD) approached western Himalayan region during April 2017. Out of five, one has caused fairly widespread to widespread rainfall/snowfall over Jammu & Kashmir & Himachal Pradesh and Uttarakhand during 6th to 12th April with isolated heavy falls over Jammu & Kashmir on 6th & 7th April; three of rest four caused scattered to fairly wide spread rainfall/snowfall over western Himalayan region and rest one caused isolated light rainfall over western Himalayan region.

Thundersquall (TS) & Hailstorm activity during the month :

S. No.	Region	TS Days	Maximum TS Activity on	*Hail/squall
1.	South Peninsular India	24	21-04-2017	Thundersquall: 01 Hailstorm: 01
2.	Northwest India	20	05-04-2017	Thundersquall: 01 Hailstorm: 14
3.	Northeast India	27	02-04-2017 02-04-2017	Thundersquall: 11 Hailstorm: 04
4.	East India	24	19-04-2017	Thundersquall: 11 Hailstorm: 06
5.	Central India	10	01-04-2017 29-04-2017	Thundersquall: 01 Hailstorm: 01
6.	West India	-	-	-

*These events were forecasted in advance and Nowcast Guidance Bulletins along with FDP Storm Bulletins were issued in connection with these convective phenomena on daily basis.

Rainfall in April, 2017

Rainfall during the month of April, 2017 was large excess in 3, excess in 5, normal in 3, deficient/large deficient in 21 and no rain in 4 of 36 meteorological sub- divisions. The rainfall for the country as a whole for the month has been recorded as 44.5 mm (+16%) against the normal rainfall for the month as 38.3 mm.

Heavy Rainfall Verification for the month: Total No. of Heavy Rainfall events(≥ 64.5 mm): 52

Lead Time	24 hours	48 hours	72 hours
Percentage correct	91	91	90

Heat Wave Verification for the month : The heat-wave forecast is issued at different time scales starting from Nowcasting (few hour) at city level, short to medium range (up to 5 days) at district levels, extended range (up to 4 weeks) at meteorological sub-division level and long range forecast (seasonal outlook on maximum temperature and heat wave) in sub-divisional scale during 2017. A special bulletin is prepared daily indicating past heat conditions in the country and the forecast and warning on heat wave for next five days in both text and graphics form. The warning on heat wave is disseminated to general public and disaster managers at meteorological sub-divisional level through IMD headquarter and administered through Meteorological and Regional Meteorological Centres. A special web page has been created for the dissemination of heat wave information from IMD web site (www.imd.gov.in). The press and electronic media are briefed twice-a-day daily. The special press release on heat wave conditions during next two weeks is issued on weekly basis. In addition, the heat wave bulletin is also issued to various stakeholders like health (Indian Medical Association & Red Cross), surface transport, municipal corporations, power sector in real time for inventorization of reported cases of Heat stress/stroke at hospitals and awareness to prevent exposure to severe heat during the day. Heat wave to severe heat wave conditions observed over parts of Jammu & Kashmir and Himachal Pradesh, Punjab, Haryana, Chandigarh, Delhi, Rajasthan, Madhya Pradesh Gujarat & Vidarbha on few days; over parts of Uttarakhand ,Chhattisgarh, Jharkhand, western parts of Bengal, interior Odisha, Madhya Maharashtra, Coastal Andhra Pradesh and Tamilnadu on one or two days of the month. Heat wave warnings skill (% correct) during April 2017 is as follows:

Lead Time	24 hours	48 hours	72 hours
(% Correct)	92	89	89

Modelling: The NCMRWF global coupled model which has been implemented for real-time is running on Bhaskara HPC system for a 15-days forecast on daily basis since March 2017. The atmosphere model component has a resolution of around 65 km with 85 vertical levels. The ocean model has resolution of around 25 km with 75 vertical levels. A case study of recent cyclonic storm 'Maarutha' shows that the global coupled model is able to predict the location several days in advance and results are comparable with the high resolution (17 km) atmospheric only model in terms of track/location.

Daily All India Weather Summary and Weekly Weather Reports are being brought out on routine basis. Climate Diagnostics Bulletin of India for February 2017 and January – February 2017 (Winter Season) were brought out.

The publication 'Extremes of Temperatures and Rainfall for Indian Stations (upto 2012)' was published. ENSO bulletin and Seasonal Climate Outlook for South Asia for the month of March 2017 were issued.

Geoscience Research

Seismological Observational Network

Observation Type	Target for XII Plan	Commissioned so far	Data reporting during the month
Seismic stations	130	99	62
GPS stations	40	28	24

Earthquake and Tsunami monitoring

Earthquake: 16 earthquakes were monitored in the Indian region out of which 3 events were greater than magnitude (M) of 5.0.

Tsunami: 3 major seabed earthquakes(M> 6) with a potential to generate tsunami were monitored. This information was provided within 12 minutes of occurrence in respect of 1 events, and between 12 to 15 minutes of occurrence in respect of 2 events.

Ocean Observation System

Type of Platform	Target	Commissioned till April, 2017	Data received during April, 2017
Argo Floats	200	294	138
Drifters*	150	103	5

Moored Buoys	16	19	19
Tide Gauges	36	34	27
High Frequency(HF) Radars	10	10	8
Current Meter Array	10	11	2
Acoustic Doppler Current Profiler(ADCP)	20	20	20
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	9
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)	30
5.	Coral Bleaching Alert System	10

A MoU has been signed with Odisha State Fisheries Department on seamless dissemination of INCOIS services using Mobile based Dissemination System and Electronics Display Board on April 15, 2017.

Polar Expedition

Winter batch of Indian Arctic expedition 2016-17 successfully completed the studies pertaining to monitoring mass balance and dynamics of selected glaciers, and Arctic precipitation and atmospheric aerosols measurements.

Ocean Technology

A Web Atlas with Digital map showing shoreline response due to coastal structures along the Tamil Nadu coast was released by Secretary, MoES on 20th April 2017 .

Marine Living Resources

Underwater bio-diversity studies carried out in collaboration with CMLRE, Cochin using Shallow water ROV (PROVe) at Arabian Sea at a depth of 200m. - Underwater visuals and scientific data were recorded at 39m, 96m and 200m three dives.

Topographic Survey of Exclusive Economic Zone

Multibeam bathymetric survey of 28500 sq. km of area in deep sea was completed.

Capacity Building and Outreach

Parliamentary Standing Committee on Science & Technology, Environment & Forests visited IMD on 24th April 2017 to have on-the- spot assessment of the functioning of the Weather Forecasting System. Presentations were made before the committee on Weather Forecasting Services of IMD with a real time demonstration of forecasting activities and roles of Radar & Satellites in Weather Forecasting. The members of the Parliamentary Standing Committee appreciated the functioning of IMD, specially the weather forecast and warning services.

Indian Institute of Tropical Meteorology(IITM) in collaboration with IMD and Indian Meteorological Society (IMS) organised a "Training Workshop on Extreme Weather Event" with special focus on lightning during 4-7 April 2017 at IITM, Pune to educate about the precautions that may to be taken to decrease the losses in the above natural hazards. 36 officials of various State Governments dealing with in disaster management attended the workshop. A brochure containing the general information about lightning and precautions that may be taken to avoid lightning damages was also published in English Language. The publication of the above brochure in Hindi and Marathi language is in progress.

A Workshop on "Two Decades of Observing the Oceans", at National Institute of Ocean Technology (NIOT) was organised on 22nd April 2017 to commemorate two decades of service by NDBP/OOS programme to our country. Souvenir and Footprints -a coffee table book were released during the event .

A workshop on "Underwater Vehicles" was conducted on 12th April 2017 at NIOT. Scientists, industrialists and users from different parts of the nation participated in the workshop.

A brainstorming meeting on roadmap for clean water using desalination in India was held on 5th April 2017 at NIOT to discuss plans for scaling up sea water desalination development with several stakeholders including IITs, MoDW&S, ONGC, DST, TTPS, CMWSSB etc.

A buoy awareness campaign was conducted on 19th April, 2017, among the coastal community at Vasco fishing harbor with the support of coast guard and department of fisheries.

A training workshop focused on hands-on climate forecasting co-sponsored by World Meteorological Organisation (WMO) was organized at IITM during 13-21 April 2017. The workshop focused on GIS (Geographic Information System) applications, prediction tools, and South and Southeast Asia and dovetail it with South Asian Climate Outlook Forum (SASCOF). About 50 (30 International and 20 National) participants including about 10 instructors from around the world participated in the Workshop.

IMD and IMS, Kolkata Chapter jointly organized the National Seminar on Thunderstorms: Socio-Economic Impacts, Early Warning and Risk Management on 29.04.17 at Kolkata.

A Half day User Meet on Weather Services: Emerging needs and Way forward was conducted on 19th April 2017 at Chennai. Sixty-one(61) Participants from various Central / State organizations participated in the user meet.

Oceanographic Research Vessel Sagar Kanya was deployed from 05 to 08 April, 2017 for training / acclimatization of students for understanding use of various oceanographic instruments for collection of data & analysis, seabed & water column sampling operations etc.

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	27	3	2	=
SagarManjusha	23	7	4	-
Sagar Purvi	2	26(Dry dock)	1	2
Sagar Kanya	3	27(Repairs/Dry dock)	1	-
Sagar Sampada	24	6	1	-

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

Subject	Publications		Ph.Ds	
	April 2016- March,2017	April, 2017	April 2016 - March,2017	April, 2017
Atmospheric Sciences	177	12	6	--
Ocean Science and Technology	54	9	2	--
Polar Sciences	32	1	-	--
Geosciences and resources	8	7	-	--
Total	271	29	8	--