

Ministry of Earth Sciences (MoES)
Summary of Important Developments –July,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 :** 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
20	96

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.

9. (i)**Confirmation that the incumbency details of all posts in the Ministry/Department and its organizations falling under the purview of the ACC have been updated on AVMS:** It is confirmed that the incumbency details of all the posts in the Ministry/Department and its organizations falling under the purview of the ACC have been updated on AVMS and are placed at Annex-II.

(ii)**Status regarding compliance of the directions of ACC:** It is also confirmed that the directions of ACC are complied with.

(iii)**Status of cases where recommendations from PESB have been received but the proposals are yet to be submitted to the ACC Secretariat :** NIL

Annex-I

Important policy decision taken and major achievements:

Ministry of Earth Sciences (MoES) Foundation Day was celebrated on 27th July 2017 at the Vigyan Bhavan, New Delhi. The Union Minister of Science & Technology and Earth Sciences, Dr. Harsha Vardhan and the Minister of State of Science & Technology and Earth Sciences, Shri Y. S. Chowdary were the Chief Guest and Guest of Honour respectively. The foundation day lecture was given by Dr. Michael McPhaden, an eminent scientist from USA on Ocean Sciences. The Life Time Excellence Award was awarded to Professor K. Gopalan for his significant contribution in the field of isotope geoscience. The National Awards for Ocean Science & Technology, Atmospheric Science & Technology and Geoscience & Technology were presented to Prof. P. N. Vinayachandran, Dr. K. Krishamoorthy and Professsor K. S. Krishna respectively with Young Researcher Awards to Dr. Dhanya C.T. and Dr. Vikram Vishal for their outstanding work in Earth Science & Technology. In addition, certificates of merit were also presented to the scientists from the Ministry. School Children from different age groups were awarded in drawing competition.

The Interim report prepared by Centre for Climate Change Research (IITM) was released on this occasion. The report presents the updated assessment of observed climate change and future climate projections over India.

India Quake' a Mobile App developed by the National Centre for Seismology for automatic dissemination of earthquake parameter after the occurrence of earthquakes was launched.

Another App "Sagar Vani" was also released that would provide fishermen communities ocean information services like alerts and advisories when such an adverse situation approaches. This app is expected to save many lives at sea.

The southwest monsoon further advanced and covered the whole country on 18th July 2017.

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 July, 2017	Data reporting
Automatic Weather Station (AWS)	675	682	352
Automatic Rain Gauge(ARG)	1350	1350	580
GPS Sonde	10	43	32
Doppler Weather Radar(DWR)	23	22	19

Ozone	17	15	5
Black Carbon Monitoring Systems (Aethalometer)	16	16	15
Other Rain Gauges excluding ARG and AWS @	-	-	2368
Nephelometer	-	12	12
Sky Radiometer	-	12	8
Aviation	--	73	73

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

A Letter of Agreement (LoA) was signed on 24th July 2017 between IMD and Collector Diu Administration (CDA) for the provision of Meteorological Aviation Services at Diu Airport.

Atmospheric Processes, Modeling and Services

Monthly Weather Summary (July, 2017)

Western Disturbance: Eight (8) western disturbances passed across western Himalayan region and adjoining plains of northwest India during 2-3, 4-8, 9-11, 12-16, 16-19, 20-22, 23-27 and 28-31 July 2017. Interaction of these western disturbances with lower level monsoon easterlies caused scattered to widespread rainfall activity over western Himalayan region and adjoining plains of northwest India with isolated heavy to very heavy rainfall over the region on a few days during the month.

Low Pressure Systems:

Depression over the Bay of Bengal (18-19 July 2017): In association with active monsoon conditions, a low pressure area formed over northwest Bay of Bengal (BoB) off north Odisha & Gangetic West Bengal coast on 15th morning. It concentrated into a depression over northwest & adjoining west central BoB and coastal areas of Odisha in the morning of 18th. It weakened into a well marked low pressure area in the morning of 19th over interior Odisha and neighbourhood and into a low pressure area over interior Odisha and adjoining Chhattisgarh in the evening of 19th July 2017. It lay over central part of north Madhya Pradesh on 20th, over northwest Madhya Pradesh on 21st, over southeast Rajasthan & neighbourhood on 22nd, over East Rajasthan & neighbourhood on 23rd, over south Rajasthan & neighbourhood on 24th, over central part of Rajasthan on 25th and became less marked on 26th July. Under the influence of the Depression, rainfall at most places with heavy to very heavy rainfall at a few places and isolated extremely heavy rainfall occurred over Chattisgarh on 17th and over Vidarbha on 18th July. Rainfall at most places with heavy to very heavy rainfall at isolated places occurred over Odisha, Vidarbha, coastal Andhra Pradesh, Telengana on 17th, over Odisha, West Madhya Pradesh, Chhattisgarh and Coastal Andhra Pradesh on 18th, Vidarbha and Chhattisgarh on 19th and over Madhya Pradesh and Chhattisgarh on 20th & 21st July. Rainfall at most places with heavy to very heavy falls at a few places occurred over Rajasthan during 23rd – 26th, with isolated extremely heavy falls on 24th and 25th. Heavy to very heavy rainfall also occurred at a few places over Gujarat region during 21st – 25th with isolated extremely heavy falls during 23rd to 25th July.

Land Depression over Jharkhand (26-27 July 2017): In association with active monsoon conditions, an upper air cyclonic circulation developed over south Bangladesh and Gangetic West Bengal and adjoining north Bay of Bengal in the morning of 22nd July. It lay as a well marked low pressure area over Gangetic West Bengal and adjoining Jharkhand in the morning of 24th. It concentrated into a depression over northwest Jharkhand & neighbourhood in the morning of 26th. It moved northwestwards and maintained the intensity of depression till early morning of 27th It then weakened into a well marked low pressure area over northeast Madhya Pradesh and neighbourhood in the morning of 27th July. Under the influence of this depression, rainfall at most places with heavy to very heavy rainfall at a few places and isolated extremely heavy rainfall occurred over Jharkhand on 25th and over West Madhya Pradesh on 27th. Rainfall at most places with isolated heavy to very heavy rainfall occurred over Chhattisgarh and east Uttar Pradesh on 25th; over Chhattisgarh, Uttar Pradesh, and Madhya Pradesh on 26th and over West Uttar Pradesh and Madhya Pradesh on 27th.

Low pressure Areas: A low pressure area formed over northeastern parts of Uttar Pradesh & neighbourhood on 7th. Under the influence of its remnant cyclonic circulation over western parts of Bihar & neighbourhood, it again lay as a low pressure area over East Uttar Pradesh & neighbourhood on 11th. It became a well marked low pressure area over southeast Uttar Pradesh & adjoining northeast Madhya Pradesh on 12th July 2017. It lay over northern parts of central Madhya Pradesh & adjoining East Uttar Pradesh on 13th; over West Madhya Pra-

desh & neighbourhood on 14th July. It lay as a low pressure area over West Madhya Pradesh & adjoining south-east Rajasthan on 15th; over south Pakistan & neighbourhood on 16th July and became unimportant in the morning of 17th July 2017. Very heavy rainfall (>11 cm) at isolated places observed over Bihar and Uttar Pradesh mainly from 9th to 12th, over Madhya Pradesh from 11th to 14th and over East Rajasthan from 14th to 16th with isolated extremely heavy falls (≥ 20 cm) on 14th. Heavy to very heavy rainfall with isolated extremely heavy falls was also observed over Gujarat region from 13th to 15th and over Saurashtra & Kutch on 15th & 16th July 2017.

IMD continuously monitored, predicted and issued early warning services to disaster managers at national, state & district levels with respect to genesis, intensity, movements of these low pressure systems and associated adverse weather including heavy rainfall warnings.

Advance and set up of monsoon: The southwest monsoon further advanced into remaining parts of Bihar, most parts of Madhya Pradesh & Uttar Pradesh and some more parts of Rajasthan; some parts of Uttarakhand, Himachal Pradesh and Jammu & Kashmir on 1st July; into some more parts of Rajasthan and Himachal Pradesh, remaining parts of Madhya Pradesh, Uttar Pradesh and Uttarakhand, entire National Capital region NCR of Delhi and some parts of Haryana on 2nd July; into some more parts of Himachal Pradesh and Jammu & Kashmir on 3rd July; into remaining parts of Himachal Pradesh and Jammu & Kashmir; some more parts of Rajasthan and Haryana on 12th July; and covered remaining parts of the country and hence whole country on 18th July 2017.

National Centre for Medium Range Weather Forecasting(NCMRWF) started providing real-time products on daily basis from NCMRWF global NEMO model based Ocean assimilation-Forecast data to Indian National Centre for Ocean Information Services(INCOIS) and National Centre for Antarctic and Ocean Research(NCAOR). The products are analysed and forecast are provided up to 10 days for standard ocean surface and sub-surface fields like, salinity, temperature, ocean currents and sea-ice parameters for north and south Polar Regions. INCOIS and NCAOR will verify and use these products for operational purpose. Similar products from NCMRWF coupled model system also being provided to INCOIS and NCAOR up to day-15 on daily basis.

Rainfall in July, 2017

Rainfall during the month of July, 2017 was large excess in 3, excess in 4, normal in 14, deficient/ large deficient in 15 and no rain in 0 of 36 meteorological sub- divisions. The rainfall for the country as a whole for the month has been recorded as 294 mm (+2%) against the normal rainfall for the month as 289.2 mm.

Heavy Rainfall Verification for the month: Total No. of Heavy Rainfall events: 493(over northeastern states during 11th to 20th June 2017)

Lead time of forecast→	24 hour	48 hour	72 hour
Percentage correct	68	70	68

Daily All India Weather Summary, Weekly Weather Reports and All India Special Daily Weather Report for southwest monsoon season are being brought out on routine basis.

Climate Diagnostics Bulletin of India for June 2017, Pre-monsoon Season (March-May 2017) and Annual Climate Summary 2016 were brought out.

ENSO bulletin and Seasonal Climate Outlook for South Asia for the month of June 2017 was issued.(Link : www.imdpune.gov.in/Clim_Pred_LRF_New/Products.html)

Geoscience Research

Seismological Observational Network

Observation Type	Target for XII Plan	Commissioned so far	Data reporting during the month
Seismic stations	130	99	59
GPS stations	40	28	22

Earthquake and Tsunami monitoring

Earthquake: 29 earthquakes were monitored in the Indian region out of which one event was greater than magnitude (M) of 5.0.

Tsunami: 5 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 4 events and within 12- 15 minutes in respect of remaining event.

Ocean Observation System

Type of Platform	Target	Commissioned till July, 2017	Data received during July, 2017
Argo Floats [^]	200	296	141
Drifters [*]	150	103	3
Moored Buoys	16	19	17
Tide Gauges	36	34	28
High Frequency(HF) Radars	10	10	9
Current Meter Array	10	11	2
Acoustic Doppler Current Profiler(ADCP)	20	21	18
Tsunami Buoys	7	9	4
Wave Rider Buoy	16	16	12

*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)	31
2	Tuna Fishing Advisories	1
2	Ocean State Forecast(OSF)-Wave, Wind, Currents, SST, MLD and D20 forecasts	31
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

Himalayan Cryosphere Studies:

A team of researchers are presently undertaking glaciological studies at Chandra basin, Himachal which includes monitoring of installed stakes over Sutri Dhaka, Batal, Samudra Tapu, Gepang Gath, Kunjam and Bara Shigri glacier, data collection and maintenance of Automatic Weather Station, collection of water level data from four locations, DGPS survey, Ground Penetrating Radar (GPR) survey, bathymetry survey of Gepang Gath lake and installation of two Autonomous Weather System(AWS) etc.

Topographic surveys of Exclusive Economic Zone:

Area covered during the month: 30,800 sq. km(approx.)

Capacity Building and Outreach:

One day training course was conducted at NCAOR, Goa for the thirteen participants (Nine international officers and four Indian officers) from the National Institute of Hydrography, Naval Area, Goa and educated them about the NCAOR research activities in the Polar Regions viz. Arctic, Antarctic, Southern Ocean and Himalya focusing the global climate and ecosystem studies.

National Centre for Medium Range Weather Forecasting(NCMRWF) organised the 'UM partners LFRic Workshop' during 4-6 July, 2017 at Prithvi Bhavan, MoES, New Delhi. Subsequently a preliminary version of LFRic dynamical core was implemented and tested on Bhaskara High Performance Computer to run the core on single or multi processors.

Indian Institute of Tropical Meteorology(IITM) conducted a workshop on "A Short Course on Dynamic Data Assimilation: Theory and Applications" during 26 June - 7 July 2017 with Prof. S. Lakshmivaran, University of Oklahoma, Norman, Oklahoma, USA as the chief Resource person for the workshop. This course provided a classification of forecast errors and develop methods for correcting forecast errors using Dynamic Data Assimilation - which is a process for systematic fusion/merging of data into the models. The aim of this course is to provide a broad background on the basic principles and mathematical tools needed to assimilate data into models of

various kinds and analyze the forecast generated from the assimilated models. Forty (40) participants including 2 international participants from South Korea attended the workshop.

A 5-day National training workshop on Greenhouse gas measurements, interpretation and inverse modeling was organized at IITM, Pune during 10-14 July 2017. Experts from Japan Agency for Marine Science and Technology (JAMSTEC), Indian Space Research Organisation (ISRO), Space Physics Laboratory (SPL), CSIR *Fourth Paradigm* Institute Bangalore, Indian Institute of Science, Education and Research (IISER), Kolkata, IISER Pune, Indian Institute of Science (IISc) and IITM. Scientists and scholars from various research institutes and academic institutions across the country participated in the workshop.

One day Hindi Workshop was organized by the Official Language Implementation Committee at IITM on 27th June 2017. Various scientific and administrative talks were delivered by IITM scientist and staff

A training course on "Seaglider Fundamentals and Data Analysis" under Ocean Mixing and Monsoon (OMM) programme was held during July 18-21, 2017. Eleven (11) participants from 4 Indian institutes attended the course. Prof. Craig Lee and Dr. James Bennet from Applied Physics Laboratory (APL), University of Washington, USA delivered lectures and conducted hands on exercises involving various data sets.

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	23	8	3	-
Sagar Manjusha	15	16	2	-
Sagar Purvi	8	23	2	-
Sagar Kanya	0	30(Dry Dock)	-	-
Sagar Sampada	29	2	1	-

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

Subject	Publications			Ph.Ds		
	April – June, 2017	July, 2017	Total	April – June, 2017	July, 2017	Total
Atmospheric Sciences	34	13	47	2	--	2
Ocean Science and Technology	15	5	20	-	--	
Polar Sciences	3	2	5	1	-	1
Geosciences and resources	10	-	10	-	-	--
Total	62	20	82	3	--	3

Annex II

Ministry of Earth Sciences

CERTIFICATE
(For the month of July, 2017)

It is certified that the detailed status regarding all the posts pertaining to Ministry/Department of Earth Sciences have been updated on AVMS as on last day of the month of July, 2017. A summary of the status is given below :

- (a) Total number of posts required to be entered on AVMS : 6
- (b) Number of posts filled as on date : 5
- (c) Number of posts totally vacant as on date : 1
- (d) Number of posts under additional charge arrangement : 1
- (e) Number of posts that would fall vacant during the next 06 months : Nil

(RKB Patel)
Deputy Secretary