Ministry of Earth Sciences (MoES)
Summary of Important Developments –May, 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.	Dt 14/08/2014 PROPOSAL FOR KRILL FISHING 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 MoESwill study legislations enacted by other member countries before finalising the draft legislation as part of international convention obligations. 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.	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.	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.

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
14	29

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 he proposals are yet to be submitted to the ACC Secretariat** : NIL

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Annex-I

Important policy decision taken and major achievements:

An integrated early warning System of Air Quality and Weather Forecasting And Research(SAFAR) was dedicated to the nation by Dr Harsh Vardhan, Hon'ble Union Minister Science and Technology and Earth Sciences along with several State Ministers and dignitaries on 12th May 2017 in Ahmedabad. With the advent of SAFAR, a new health action plan "Ahmedabad- AIR (Air Information and Response)" was launched with a lead from Ahmedabad Municipal Corporation and other research organizations which will connect SAFAR products with health related mitigation options.

A project for Commissioning of Polarimetric Doppler Weather Radar at a total cost of Rs. 99.20 crore was approved for implementation during 2017-20.

Monsoon reached Kerala exactly on 30th May,2017 as per the forecast issued on 16 May 2017 without any error.

Rainfall forecast for Sri Lanka was provided on daily basis to Prime Minister's Office during the period 28 May - 04 June 2017.

National Centre for Medium Range Weather Forecasting(NCMRWF) under Ministry of Earth Sciences has started generating snow forecasts from NCUM global model for Himalayan region.

The cloud physics laboratory was re-established in Braemore, Thiruvananthapuram on 12 May, 2017. The instruments installed at the site include Micro rain radar, Disdrometer, Ceilometer and a weather station.

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 May, 2017	Data reporting
Automatic Weather Station (AWS)	675	682	368
Automatic Rain Gauge(ARG)	1350	1350	548
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 @	-	-	2384
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 (May, 2017)

Cyclonic Storm "Mora" over Bay of Bengal (28-31 May 2017): A depression (D) was developed over south-east and adjoining eastcentral Bay of Bengal (BOB) in the early morning of 28th May, 2017. Moving northeast-wards, it intensified into a deep depression (DD) in the afternoon and into a cyclonic storm (CS) "MORA" over eastcentral BOB in the late evening of 28th. Moving north-northeastwards, it further intensified into a severe cy-clonic storm (SCS) in the evening of 29th. The system reached its peak intensity in the early hours of 30th. It con-tinued to move nearly north-northeastwards and crossed Bangladesh coast close to south of Chittagong in the forenoon (between 0930 and 1030 hrs IST) of 30th. After landfall, the system weakened into a CS in the after-noon of 30th, into a DD in the evening and D in the same night. It further weakened into a well marked low pres-sure area over Nagaland and neighbourhood in the early morning of 31st, into a low pressure area in the fore-noon and became less marked in the same afternoon. The weather forecasts in this regard were provided peri-odically.

Western Disturbance & Thunderstorm: Six (6) active western disturbance passed across western Himalayan region and Rajasthan during 3–6, 7–10, 10–18, 14–19 and 22–26 May 2017. These western disturbances caused isolated to fairly widespread rainfall activity over western Himalayan region and isolated activity over ad-joining plains of northwest India. Thunderstorm with squall / gusty winds was also observed at one or two places over northwest & eastern India on one or two days. Fairly widespread to widespread rain/ thundershower activity was observed over Kerala during last week of the month.

Thundersquall (TS) & Hailstorm activity during the month :

S. No.	Region	TS Days	Maximum TS Activity on	Hail/squall
1.	South Peninsular India	28	10-05-2017	Thundersquall: 08 Hailstorm: Nil
2.	Northwest India	28	29-05-2017	Thundersquall: 04 Hailstorm: 09
3.	Northeast India	29	05-05-2017	Thundersquall: 03 Hailstorm: 03
4.	East India	30	01-05-2017	Thundersquall: 19 Hailstorm: 04
5.	Central India	26	27-05-2017	Thundersquall: 01 Hailstorm: Nil
6.	West India	-	-	-

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

Rainfall in May, 2017

Rainfall during the month of May, 2017 was large excess in 8, excess in 5, normal in 6, deficient/ large deficient in 14 and no rain in 3 of 36 meteorological sub- divisions. The rainfall for the country as a whole for the month has been recorded as 28.4mm (-8%) against the normal rainfall for the month as 30.9 mm.

Heavy Rainfall Verification for the month: Total No. of Heavy Rainfall events: 39, Very Heavy Rainfall events:11

Days→	Day 1	Day 2	Day 3
Percentage correct	0.83	0.84	0.83

Heat Wave : Heat wave conditions prevailed at a few places over Marathawada, Vidarbha, Telangana and coastal Andhra Pradesh on many days during 15 to 22 May, 2017. Heat wave at a few places prevailed over Odisha and Jharkhand on some days and over Uttar Pradesh, Haryana, Chandigarh & Delhi on one or two days of the month. Heat wave warnings skill (% correct) during May 2017 is as follows:

Days→	Day 1	Day 2	Day 3
Percentage correct	0.92	0.95	0.97

Daily All India Weather Summary and Weekly Weather Reports are being brought out on routine basis.
Climate Diagnostics Bulletin of India were brought out for March 2017.
ENSO bulletin for South Asia for the month of May 2017 were issued.

Atmospheric Research

A Rapid scan of INSAT-3DR jointly planned by India Meteorological Department (IMD) & International Space Research Park (ISRP) at the John F. Kennedy Space Center, Florida, USA was executed for the first time on 15th May 2017 for the study of thunderstorm and rainfall activities over North-eastern states.

Special forecast products based on NCMRWF models were provided for SHAR region during the launch of the 'South Asia Satellite' or GSAT-09 on 5th May 2017.

The experimental real-time extended range prediction based on 24th May 2017 initial condition has been made available at http://www.tropmet.res.in/erpas/. Rainfall, Maximum & Minimum temperatures, MJO forecast, soil moisture (0-10cm), Relative humidity and cyclogenesis predictions are also available at the same link. This forecast has been prepared using CFS (T126 & T382) and GFS(T126 & T382). After successful experimental real time forecast, the global short range ensemble forecast system at resolution T574 with 21 members is operationally implemented on 7 May 2017.

Geoscience Research

Seismological Observational Network

Observation Type	Target for XII Plan	Commissioned so far	Data reporting during the month
Seismic stations	130	99	58
GPS stations	40	28	22

Earthquake and Tsunami monitoring

Earthquake: 29 earthquakes were monitored in the Indian region out of which 4 events were greater than magnitude (M) of 5.0.

Tsunami**:** 2 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 both the events.

Ocean Observation System

Type of Platform	Target	Commissioned till May, 2017	Data received during May, 2017
Argo Floats^	200	288	134
Drifters*	150	103	7
Moored Buoys	16	19	14
Tide Gauges	36	33	27
High Frequency(HF) Radars	10	10	7
Current Meter Array	10	11	2
Acoustic Doppler Current Profiler(ADCP)	20	21	18
Tsunami Buoys	7	9	6
Wave Rider Buoy	16	16	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	15
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)	26
5.	Coral Bleaching Alert System	11

The Ocean State Forecasts predicted the high waves on the Rameswaram coast due to *Kondal Kattu (high gusty winds)* on 18th May 2017 for high winds (18-21 m/s) and waves (2.5-3.5 m) particularly off the coast from Kolachal to Rameswaram from 20.30 hrs on 18-05-2017 to 05.30 hrs of 19-05-2017. The alerts were appreciated by the fisher folk, as they could save their livelihood assets without damage due to the prior information.

Ocean State Forecast along the ship-routes were issued for the cruise onboard TDV Sagar Nidhi during 20-29 April, 2017.

Polar Science

A 21 kyr climate record was reconstructed from Mochou Lake sediment core of Larsemann Hills, East Antarctica. Operational monitoring of Antarctic iceberg calving events using Indian remote sensing satellite data indicates that the icebergs were found to have lost mass because of surface melting and therefore have reduced in dimension depicted by 12.51 % lapse in terms of surface area. Also, the coastline was visually observed to have retracted, instigated by calving events from the polar ice sheet and generation of new icebergs in Prydz Bay..

Topographic surveys of Exclusive Economic Zone:

Area covered during the month : 41,000 sq. km

Capacity Building and Outreach

Over 150 members of the total 207 expedition members who participated in the Indian Scientific Expeditions to Antarctica, were felicitated during the debriefing function held at National Centre for Antarctic and Ocean Research(NCAOR),Goa on May-15, 2017. The list included members from the 34thwinter team, 35thwinter and summer team and the 36thsummer team. Six leaders from these teams presented their works with scientific, logistic objectives and problems faced with the solutions thereof.

Ministry of Earth Sciences (MoES) organised a workshop commemorating 30 years of allocation of 1,50,000 sq. km of area in Central Indian Ocean Basin by the United Nations in 1987 at National Institute of Oceanography, Goa on 30th May, 2017. India was the first country to have been allocated the Area for exploration of polymetallic nodules.

Summer school was conducted at NCAOR from 8-11 May 2017, on "Antarctic climate variability and ice dynamics". NCAOR and Norwegian Polar Institute scientists delivered lectures and hands on training to 35 student participants from various universities/research institutes.

An International NASA-ARSET workshop on Remote Sensing of Air Quality: Data, Tools and Applications was organised at Indian Institute of Tropical meteorology(IITM) during 23 - 26 May 2017. This training covered the access and use of NASA resources for decision-making activities related to air quality. About 45 participants including Air quality professionals and decision makers from local, state, and federal agencies, NGOs and the private sector, various scholars from research institutes across the country and engineers from Pollution Control Board participated in the Training Workshop. Participants were made familiar to use available data portals and visualization tools to identify, track, and measure air quality events of their choosing.

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	24	7	2	-
Sagar Manjusha	23	8	3	-
Sagar Purvi	11	20(Dry dock)	1	-
Sagar Kanya	4	27(Dry Dock)	1	-
Sagar Sampada	25	6	2	-

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

Subject	Publications			Ph.Ds	
	April 2017	May, 2017	Total	April 2017	May, 2017
Atmospheric Sciences	12	13	25	-	1
Ocean Science and Technology	9	5	14	-	-
Polar Sciences	1	1	2	-	-
Geosciences and resources	7	3	10	-	-
Total	29	22	51	-	1

Annex II

Ministry of Earth Sciences

CERTIFICATE
(For the month of May, 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 May, 2017. A summary of the status is given below :

(a) Total number of posts required to be entered on AVMS : 2
(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

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