

Ministry of Earth Sciences (MoES)
Summary of Important Developments –May,2019

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>A proposal has been received for krill fishing which is under examination.</p> |

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

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

•**Status of implementation of e-Governance :**Being implemented

•**Status of Public grievances:**

| No. of Public Grievances redressed during the month | No. of Public Grievances pending at the end of the month |
|---|--|
| 21 | 40 |

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 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:

- i) **Forecast of the Onset Date of Southwest Monsoon-2019 over Kerala** released on 15th May 2019 indicates that onset of monsoon over Kerala is likely to be slightly delayed to 6th June 2019 with a model error of ± 4 days.
- ii) **In accordance with 2nd stage long-range forecast on southwest monsoon issued on 31st May 2019:**
 - a) Rainfall over the country as a whole for southwest monsoon season (June to September 2019) is most likely to be NORMAL (96% to 104% of long period average (LPA)).
 - b) Quantitatively, monsoon season rainfall for the country as a whole is likely to be 96% of the LPA with a model error of $\pm 4\%$.
 - c) Region wise, the seasonal rainfall is likely to be 94% of LPA over North-West India, 100% of LPA over Central India, 97% of LPA over South Peninsula and 91% of LPA over North East India all with a model error of $\pm 8\%$.
 - d) The monthly rainfall over the country as whole is likely to be 95% of its LPA during July and 99% of LPA during August both with a model error of $\pm 9\%$.
 - e) The current weak El Niño conditions over Pacific are likely to continue during the monsoon season with some possibility of these conditions to turn to neutral ENSO conditions during the latter part of the monsoon season.

There was no matter pending before the Cabinet requiring decision/approval.

Minimum Government, Maximum Governance:

- Dissemination of Agromet Advisories to user communities through SMS and IVR technology is continued in the country through Kisan Portal and under PPP mode. Presently, 40.1 million farmers in the country are getting advisories through SMS directly.
- Adverse-weather SMS warnings are being sent through mobile to the State Government officials / Disaster-related officials / Central Government organizations/common man.
- 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 | Commissioned so far | Installations during the month | Data Reporting |
|---------------------------------|---------------------|--------------------------------|----------------|
| Automatic Weather Station (AWS) | 682 | -- | 266 |
| Automatic Rain Gauge (ARG) | 1356 | 06 (Mumbai) | 437 |

| | | | |
|--|--|-----|--|
| GPS Sonde based RS/RW Stations | 43 | -- | 37 |
| Doppler Weather Radar (DWR) | 25 | -- | 24 |
| Ozone (Ozone Sonde + Total Ozone) | 05 | -- | 04 |
| Surface Ozone (Electrochemical Concentration Cell method) | 07 | -- | 07 |
| Nephelometer | 12 | -- | 12 |
| Sky Radiometer | 20 | -- | 19 |
| Black Carbon Monitoring Systems (Aethalometer) | 25 | --- | 23 |
| Air Quality Monitoring System (SAFAR) | 10(Delhi) 10(Mumbai) 10(Ahmedabad) | -- | 10(Delhi) 10(Mumbai) 09(Ahmedabad) |
| Hydromet. (IMD & Extra-departmental excluding AWS & ARG) | --- | -- | 2597 |
| Aviation | 79 | --- | 79 |

A new Nowcast domain under MC Dehradun was created on Nowcast Warning page of IMD website for issuing three hourly Nowcast of thunderstorm for 27 stations of Uttarakhand.

Eight more stations were added on Nowcast Warning Page under MC Bhubaneshwar domain for issue of three hourly nowcast thunderstorms, thereby increasing the total number of three hourly nowcast stations to 441.

Atmospheric Processes, Modelling and Services

Advance of the Southwest Monsoon-2019 over South Andaman Sea: In view of the strengthening and deepening of cross equatorial flow, enhanced cloudiness and rainfall in association with a cyclonic circulation at mid-tropospheric levels over Andaman Sea, the southwest monsoon has advanced into south Andaman Sea, some parts of south Bay of Bengal and Nicobar Islands on 18th May 2019. It has further advanced into some more parts of southeast Bay of Bengal and north Andaman Sea, remaining parts of Nicobar Islands and southern parts of Andaman Islands on 25th May 2019, in view of sustained rainfall activity over Andaman & Nicobar Islands. In association with further deepening of South=Westerlies and increase in rainfall over Andaman Islands, it has further advanced into southernmost parts of Maldives-Comorin area, some more parts of southwest and South=East Bay of Bengal, remaining parts of Andaman Sea and Andaman Islands and some parts of East-Central Bay of Bengal on 30th May 2019.

Rainfall in May,2019: Rainfall during the month of May, 2019 was large excess in 1, excess in 4, normal in 6, deficient in 10, 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 of May, 2019 has been recorded as 51.0 mm which is 18% below its Long Period Average (LPA) of 62.3 mm.

Temperature Scenario: The Mean Temperature for the month for the country as a whole was 30.24°C; this was slightly above normal (+0.5°C).

Monthly weather summary:

Heavy Rainfall Activity: Heavy to very heavy rainfall with extremely heavy rainfall at isolated places have occurred over Odisha, Assam & Meghalaya and Nagaland, Manipur, Mizoram & Tripura on one day each during the month. **Heavy to very heavy rainfall** at isolated places have occurred over Assam & Meghalaya and Nagaland, Manipur, Mizoram & Tripura, Sub-Himalayan West Bengal & Sikkim on 2-3 days; over Gangetic West Bengal, Arunachal Pradesh, Bihar, Coastal Andhra Pradesh, Tamil Nadu & Puducherry and Andaman & Nicobar Islands on 1-2 days during the

month. **Heavy rainfall** at isolated places have occurred over Assam & Meghalaya on few days; over Arunachal Pradesh and Sub-Himalayan West Bengal & Sikkim for about seven days; over Nagaland, Manipur, Mizoram & Tripura on 3-4 days; over Jharkhand, South Interior Karnataka and Tamil Nadu & Puducherry on 2-3 days; over Jammu & Kashmir, Haryana, Chandigarh & Delhi, Gangetic West Bengal and Kerala on 1-2 days during the month.

No. of Heavy rainfall events and (% correct) of spatial distribution of warnings during May 2019 are given below:

| Lead Time | No. of Heavy Rainfall (Events): 71 (>64.4mm) |
|-----------|---|
| 24 Hour | 92% |
| 48 Hour | 93% |
| 72 Hour | 93% |

Western Disturbances and associated weather: During the month, eight (8) western disturbances have affected northwest India during 1st-6th, 4th-6th, 8th-13th, 11th-15th, 15th-19th, 19th-21st, 21st-26th and 25th-28th of May 2019. Out of these western disturbances, about four of them have caused fairly widespread to widespread rainfall/thunderstorm over Western Himalayan Region and isolated to scattered rainfall/thunderstorm activity over adjoining plains.

Thundersquall & Hailstorm activity: Thundersquall & Hailstorm activity during the month is given in the table below:

| S.No. | Region | TS Days | Maximum TS Activity | Hail | Squall |
|-------|------------------------|---------|----------------------|--|--|
| 1. | South Peninsular India | 26 | 23-05-19 | 01(Belgaum on 26 May) | 02(Bengaluru city, Bengaluru hal AP on 25/05) |
| 2. | Northwest India | 26 | 13-05-19 | 02(Amritsar, Safderjung on 17 May) 01(Churu on 20 May) | 02(Shimla on 02/05, 18/05) 02(Srinagar, Palagam on 26/05) 01(Barmer on 12/05) 02(Ganganagar 13/05) 01(Churu 14/05) 02(Pilani, Jaisalmer 15/05) 03(Mukteshwar 11/05, 16/05, 24/05) |
| 3. | Northeast India | 30 | 13-05-19 23-05-19 | 07(Agartala on 11, 13, 14, 17, 19 & 28 May) 01(Lengpui on 17 May) | Nil |
| 4. | East India | 27 | 13-05-19 14-05-19 | 03(Gangtok 11, 12 & 13 May) 01(Jamshedpur 18 May) | 01(Coochbehar 01/05) 04(Malda, Alipore, Dum Dum, Jamshedpur 13/05) 01(Jamshedpur 18/05) 02 (Malda 20/05, 30/05) 02 (Alipore, Dum Dum 25/05) |
| 5. | Central India | 18 | 28-05-19 | 01(Satna 03 May) 01(Jagdalpur 28 may) | 02(Satna, Raipur 03/05) |
| 6. | West India | - | | - | - |

Note: The convective activities mentioned above had been predicted and corresponding warnings were issued about 4-5 days in advance of the occurrence of the event.

Heat wave and maximum temperature:

- Heat wave to severe Heat wave conditions have occurred at many parts over Vidarbha and at isolated places over Coastal Andhra Pradesh on one or two days; Heat waves at many places with severe Heat wave at isolated places have occurred over Vidarbha on 3-4 days; Heat wave at few places with severe Heat wave at isolated places have

occurred over East Uttar Pradesh on 1-2 days during the month.

- Heat wave conditions have occurred at some parts of Madhya Maharashtra, Marathwada, interior Odisha and Coastal Andhra Pradesh on 3-4 days and over Madhya Pradesh, Vidarbha, East Uttar Pradesh and Bihar on 1-2 days during the month.
- Heat wave conditions have occurred at isolated places over Vidarbha on the most of the remaining days; over Telangana and East Uttar Pradesh on 4-5 days; over Bihar, Chhattisgarh, Madhya Maharashtra, Gangetic West Bengal and Rajasthan on 2-3 days and over Madhya Pradesh, Coastal Andhra Pradesh, Tamil Nadu & Puducherry, North Interior Karnataka, Haryana, Chandigarh & Delhi, Odisha and Rayalaseema on 1-2 days during the month.

The highest maximum temperature of 49.6°C was recorded at Ganganagar (West Rajasthan) on 31st May 2019 over the plains during the month.

Bulletins / Operational Reports/ Services during the month

Bulletins: All India Weather Bulletins(124), Mountain weather bulletins including severe weather warnings for western and central Himalayan Region(62), Heat wave bulletins(twice daily) (62), FDP STORM Bulletins (once daily) (31), Nowcast Guidance Bulletins for severe weather (31). All India inference and severe weather warnings(124) , Enso bulletin & Indian Ocean Dipole (IOD) Bulletin for the month of May 2019 and Seasonal Climate Outlook for South Asia for the month of May to August 2019 were issued.(Quick Link:[www.imdpune.gov.in/Clim_Pred_LRF_New/ Products.html](http://www.imdpune.gov.in/Clim_Pred_LRF_New/Products.html)). Climate Diagnostics Bulletin of India for April 2019 and Annual Climate Summary 2018

Press Releases: Cyclone FANI(6), southwest monsoon(3), Heat Wave/Severe Heat Wave (1), Current weather status and outlook for next two weeks(5), Enhanced rainfall/thunderstorm activity over northwest and adjoining central India, northeastern states and West Bengal & Sikkim during 11-16 May 2019' (1)

Reports/Maps : All India Weekly Weather Reports (5), Daily All India Weather Summary and Weekly Weather Reports, report on cyclone FANI issued on 24th May 2019 highlighting the life history, salient features, tracking, near zero landfall point error and appreciations (<http://www.rsmcnewdelhi.imd.gov.in/images/pdf/publications/preliminary-report/fani.pdf>.) Gridded Standardized Precipitation Index (SPI) & Standardized Precipitation Evapotranspiration Index (SPEI) at 0.5 *0.5 degree resolution at 4 weekly 1, 2, 3 & 4 monthly time scales Computed and maps of same timescales uploaded at weekly basis on IMD Pune website, Weekly and cumulative Standardized Precipitation Index (SPI) maps (4) for the weeks ending on 01, 08, 15, 22, and 29 May 2019 and supplied for use in Agromet Advisory Services Bulletin uploaded in IMD Pune website.

Geoscience Research

Seismological Observational Network

| Observation Type | Target | Commissioned so far | Data reporting during the month |
|------------------|--------|---------------------|---------------------------------|
| Seismic stations | 115 | 115 | 103 |
| GPS stations | 40 | 20# | 19 |

#10 VSATS (6) have been dismantled to shift them to new locations.

Earthquake and Tsunami monitoring

Earthquake: 21 earthquakes were monitored in the Indian region out of which 3 events were greater than magnitude (M) of 5.0.

Tsunami: 4 seabed earthquakes (M> 6) with a potential to generate tsunami occurred. This information was provided within 12 minutes of occurrence for both the events.

Ocean Observation System

| Type of Platform | Target | Commissioned till May, 2019 | Data received during May, 2019 |
|------------------|--------|-----------------------------|--------------------------------|
| Argo Floats * | 200 | 344 | 147 |
| Drifters* | 150 | 108 | 2 |
| Moored Buoys | 16 | 22 | 18 |
| Tide Gauges | 36 | 36 | 25 |

| | | | |
|---|----|----|----|
| High Frequency(HF) Radars | 10 | 10 | 10 |
| Current Meter Array | 10 | 11 | 2 |
| Acoustic Doppler Current Profiler(ADCP) | 20 | 20 | 17 |
| Tsunami Buoys | 7 | 9 | 5 |
| Wave Rider Buoy | 16 | 22 | 14 |

*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 | 21 |
| 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) | 28 |
| 5. | Coral Bleaching Alert System | 10 |

Indian National Centre for Ocean Information Services(INCOIS) provided daily ocean state forecasts to Maharashtra Maritime Board during 24 - 31 May 2019, at four locations for facilitating ship movements off Maharashtra.

In a study conducted by Indian Institute of Tropical Meteorology(IITM) revealed that sea-level rise in the south Indian Ocean is found to be 37% quicker than the global mean sea-level during 2000-15 with 40% contribution from the halosteric sea level primarily through the Indonesian throughflow (ITF)transport and a secondary from the local processes during 2000-15. The finding from the study indicates that accelerated sea-level rise and marine heat waves in the south Indian Ocean may impose threats to the life of coral reefs and marine ecosystems.

Survey and Exploration:

An exploration cruise for hydrothermal sulphides was conducted in two legs from 15th March 2019 to 24thMay, 19 in the contract area allocated to India in South-West Indian Ocean and carried out scientific studies.

Ocean Technology

A Memorandum of Understanding (MoU) was signed between ISRO-VSSC and MoES-NIOT on 8thMay 2019 for the development of 6000m depth rated titanium alloy personnel sphere for manned submersible.

In-situ soil tester has been successfully tested at 5000m water depth at Central Indian Ocean Basin(CIOB).

Capacity Building and Outreach

An India-UK Water Centre workshop on Science and Innovation for Catchment Management was held at the University of Warwick in Coventry, UK during 8-10 May 2019. The workshop aimed to explore and build on existing knowledge and research on integrated catchment management to enhance collaboration and to identify pathways for further improvement. Thirty six participants, including five water-related NGOs/institutes (4 from India and 1 from the UK) and six early-career researchers presented their work, shared their knowledge and co-created new proposals for research that drives towards SMART Rivers as part of integrated catchment.

Regional workshops on the network project "Unravelling Submarine Groundwater Discharge (SGD) zones along the Indian subcontinent and its islands (Mission-SGD)"was organised by National Centre for Earth Science Studies in association with National Institute of Oceanography, Goa and Department of Geology, Anna University, Chennai on 16th May 2019 and 27th May 2019 respectively.

A training cum Workshop for National and Regional Framework on Coastal Vulnerability Assessment and Monitoring for Sea-Level Rise and Storm Surges in the Indian Ocean Region under the framework of Intergovernmental Oceanographic Commission Regional Committee for the Central Indian Ocean (IOCINDIO) was organized during 27 - 31 May, 2019 at INCOIS. There were thirty nine (39) participants from the US, UK, France, Belgium, Australia, Malaysia, Kenya, Kuwait, Saudi Arabia, Bangladesh, Tanzania and India. Dr.M.A.Atmanand Director, NIOT, was the Chair of IOCINDIO.

One Day Training Program and Study Tour for IAF Officer's from Air Force Administrative College's (Coimbatore) was conducted on 2 May 2019 at Indian institute of Tropical Meteorology(IITM).

Utilization of Ocean Research Vessels during the month

| Vessel | Days at Sea / Utilization | Maintenance/ Inspection /Scientific Logistics / Cruise Preparation | No. of Cruise |
|----------------|---------------------------|--|---------------|
| Sagar Nidhi | 2 | 29 | 2 |
| Sagar Manjusha | 27 | 4 | 2 |
| Sagar Purvi | 8 | 23(maintenance) | 1 |
| Sagar Kanya | 28 | 3 | 1 |
| Sagar Sampada | 0 | 31(repair and mainenance) | - |

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

| Subject | Publications | | Ph.Ds | |
|------------------------------|--------------|-----------|-------------|-----------|
| | April, 2019 | May, 2019 | April, 2019 | May, 2019 |
| Atmospheric Sciences | 15 | 13 | -- | -- |
| Ocean Science and Technology | 8 | 4 | - | - |
| Polar Sciences | 2 | 2 | - | - |
| Geosciences and resources | 2 | - | -- | 1 |
| Total | 27 | 19 | -- | 1 |