Indian Institute of Tropical Meteorology (IITM)

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Brainstorming Workshop: Atmospheric Research Testbed Observations (ART) for Process Understanding and Model Improvements

KEY HIGHLIGHTS:

- A Brainstorming workshop on "Atmospheric Research Testbed Observations (ART) for Process Understanding and Model Improvements" was conducted at ART facility, Silkheda, Sehore District, Madhya Pradesh from 09-10 February 2026.
- Inaugurated by Hon'ble Secretary, Ministry of Earth Sciences (MoES)
- As part of the brainstorming workshop, a panel discussion was conducted under the chairmanship of the Hon. Secretary to deliberate on the current status, way forward, targeted approaches, and expectations from testbed observations, with a focus on addressing gap areas to enhance model- and process-based understanding."
- The workshop brought together researchers from observational, data assimilation, and modeling groups across India, emphasizing the growing interest in targeted observations for model improvement.
- Workshop covered utilization of observations for process-level understanding, data assimilation, verification and development of numerical weather prediction models
- Inauguration of "Varshika" Guest House at ART facility in Silkheda by the Hon'ble Secretary, Ministry of Earth Sciences (MoES) on 10th February, 2026.
- IITM is leading the establishment of research testbeds in different geographical environments in India.

February 9-10, 2026; Atmospheric Research Testbed- Central India, Silkheda: The Indian Institute of Tropical Meteorology (IITM) has established an Atmospheric Research Testbed (ART) facility in Silkheda in the monsoon core zone to improve understanding of monsoon convection processes and how they are represented in weather and climate prediction models.

The ART facility is equipped with cutting-edge remote sensing, in-situ, and profiling instruments spread across 100 acres of land.

A Brainstorming Workshop on utilization of Atmospheric Research Testbed Observations (ART) for Process Understanding and Model Improvements was conducted at ART facility from 09-10 February 2026. This workshop brought brilliant minds from observational, modelling and data assimilation areas representing MoES institutions viz., NCMRWF, IMD, NCESS, IITM and other organizations viz., IISER, IITs, SPL, PRL, NARL, NITs, CUSAT etc. The invited speakers shared their experiences on national research facilities, observational networks and their applications in process-level diagnosis, data assimilation and modeling.

As a part of this workshop, a panel discussion was conducted to deliberate on the current status, way forward, targeted approach, and expectations from the testbed observations for addressing gap areas to improve model- and process-based understanding under the chairmanship of Dr. M. Ravichandran, Secretary, Ministry of Earth Sciences (MoES). The panel includes experts from the modeling and observational fields: Dr. A. Suryachandra Rao (Director, IITM), Dr. Manish Naja (Director, ARIES), Dr. V. S. Prasad (Head of NCMRWF), Dr. Kamaljit Ray (Senior Adviser and Program Head at MoES), Prof. Ravi Nanjudiah (Professor, IISc & Former Director IITM), Dr. R. Krishnan (Former Director IITM), Dr. G. Pandithurai (Former Project Director ART), Dr. T. Narayana Rao (Sc-SG, NARL), Dr. Anupam Hazra (Project Director, Monsoon Mission), Dr. Suvarna Fadnavis (Project Director, CCCR), Dr. Sachin Ghude (Project Director, MAQWS) and Dr. B. Padmakumari (Project Director, ART). Dr. Sachin Deshpande (Deputy Project Director, ART), opened discourse on following focused topics with panelists and interactions with workshop participants.

Panel discussion on focused topics and interactions

- Modeler's observational requirements for representing/tuning parameterizations in the models (convection, land-surface, boundary layer, microphysics, radiation, and aerosol/atmospheric chemistry)
- Developing process-oriented diagnostics using observations for model evaluation
- Developing a new reanalysis dataset by merging high-resolution testbed observations with existing reanalysis data
- Using Large-Eddy Simulation (LES) to bridge the scale gap between localized observations and the coarser grids of global models
- Creating a team for dataset preparation for model use, which can act as a liaison between modeling and observation communities.
- Ground-based observations for satellite Cal/Val, and generating value-added products by integrating ground-based and satellite observations
- Deployment of guest instruments (national & international) at ART facility
- Joint observation-modelling project/experiment

The excerpts from panel discussion are presented here.
Honorable MoES Secretary, Dr. M. Ravichandran, made important remarks and offered suggestions for the ART facility's future pathway. He suggested that frequent vertical profiling using Drones and a dedicated Drone facility at ART would be useful for diurnal and day-to-day observation of atmospheric parameters. He further extended that, for the 3D-wind vertical structure, one additional Radar, completing the triangulation of two existing Radars, would be useful in Central India to understand the 3D wind structures, during depressions, and Extreme rainfall processes. He further added to broaden the expertise in observation processes and urged inviting more academics to participate in research campaign experiments at ART facility. He

further added the need for wind profiler radar for information on vertical winds which is critical for estimating observational based mass-flux profiles. Further, he concluded, emphasizing the need to spread awareness of research conducted at ART facility among the public, both locally and nationally, and to support student outreach activities.

Director IITM Dr. A. Suryachandra Rao gave remarks, opining that identifying key atmospheric processes should be the first step, which would help improve the model parametrization scheme and enhance model forecasts. He stressed that more dialogue and discussion between the modelling and observation communities would help better understand each other's roles and the data they expect. He also suggested that a more effective understanding of processes would be achieved through wider collaboration with national research institutions and by involving Academia. He also expressed the need for dedicated campaigns at the ART facility to improve understanding of micro- to macro-level atmospheric processes. He indicated that a special call for proposals from researchers on the exploitation of testbed observations for targeted process understanding will be issued.
Dr. V. S. Prasad mentioned that the use of ART C-Pol radar and radiosonde data in model assimilation has helped improve the model's representation of processes in Central India in recent years.
Dr. Kamaljit Ray stressed upon requirement of such testbed observations like ART facility in other parts of India.
Dr. Ravi Nanjundiah highlighted the tuning of boundary layer parametrization though testbed observations.
Dr. R. Krishnan recommended that assimilating GNSS satellite receiver measurements for data assimilation could further help reduce bias in meteorological products and better represent atmospheric processes. He further added a very important scientific question about extreme rainfall events over Central India and the importance and usefulness of the ART facility located strategically for critical understanding of these kinds of events.
Dr. Anupam Hazra highlighted the importance of testbed observations in tuning cloud microphysical parameterizations in the model. Another Panelist, ARIES Director Dr. Manish Naja, also emphasized the importance of additional observation requirements for atmospheric chemistry, the role of atmospheric chemistry in cloud formation, and the need for diurnal aerosol measurements to understand the complete cycle of cloud CCN chemical characteristics.
Dr. G. Pandithurai emphasized that last four years of data gathered at ART facility would be very useful for process-level understanding and validating high-resolution models.
NARL Senior Scientist Dr. T. N. Rao raised a few points regarding imperfections in the model representation of larger raindrop sizes in the model output, and on how vertical profiles and reflectivity from in-situ measurements could improve assimilation.
Dr. Suvarna Fadnavis emphasized the significance of atmospheric chemistry observations in the ART facility in central India.
Dr. Sachin Ghude pointed out that observational and modelling communities work in silos, and there is a need for enhanced participation from both groups.

The workshop facilitated collaboration among participants from different institutions/organizations to identify gap areas, critical datasets, modeling frameworks, and observational resources. A detailed report on the brainstorming workshop, including outcome and recommendations, will be prepared.

At the end of the workshop, participants were taken to various observational and laboratory facilities in the ART campus, displaying collocated and simultaneous measurements of clouds, convection, radiation, precipitation, GHGs, fluxes, moisture etc.

On February 10, 2026, the Honorable MoES Secretary, Dr. M. Ravichandran, inaugurated the "Varshika" Guest House at the ART facility in the presence of Dr. A. Suryachandra Rao, Director, IITM. This will enable local arrangements for participants in the filed campaign envisioned for the ART facility.

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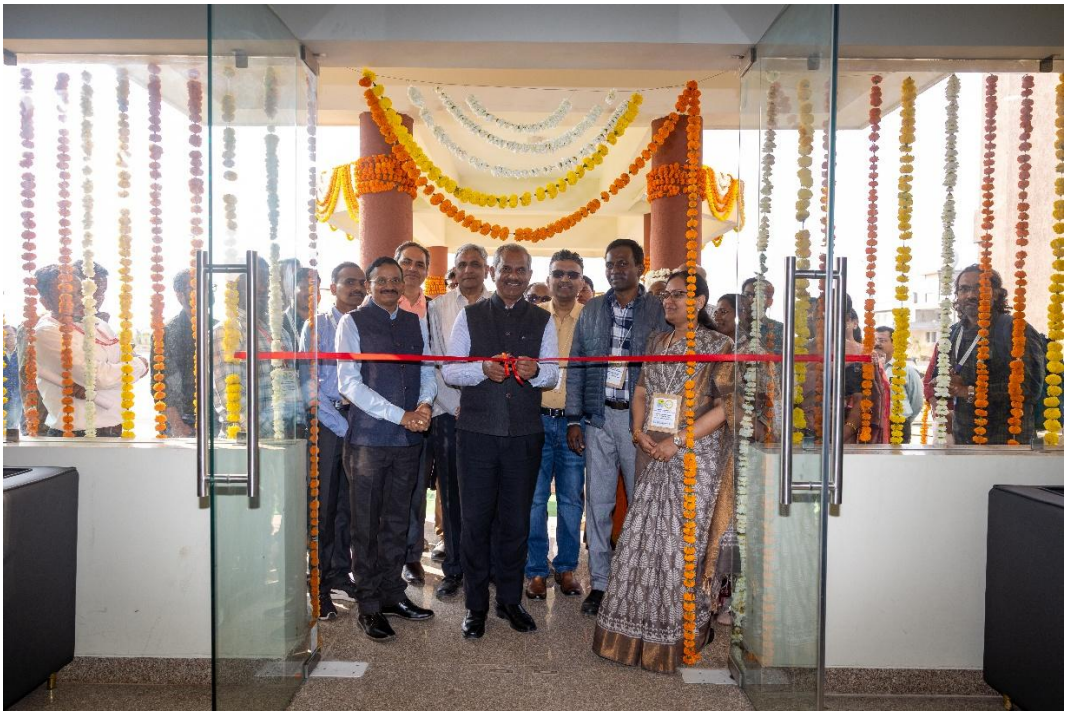
Glimpses:

Inauguration of the Brainstorming Workshop at the ART facility

Panelists for Brainstorming Workshop: ART Observations for Process Understanding and Model Improvements.

Participants and delegates of the Brainstorming Workshop

Inauguration of "Varshika" Guest House at ART facility in Silkheda, near Bhopal



Inauguration of "Varshika" Guest house at ART facility

C-band polarimetric radar control room at ART facility

72m Meteorological tower at ART facility

Atmospheric Radiation Observatory at ART facility

Areal view of ART facility in Silkheda

Visiting open field observatories of ART facility

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