Mission Mausam

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India’s Initiative to Build a Cloud Chamber Under Mission Mausam

Context:

Mission Mausam, launched by the Indian government, is a forward-looking initiative aimed at enhancing weather forecasting and managing weather events. The mission includes efforts to modify weather patterns such as rainfall, hail, fog, and potentially even lightning strikes.

One of the mission's primary focuses is research in **cloud physics**, which plays a crucial role in effective weather modification. To support this objective, **India is building its first cloud chamber** at the **Indian Institute of Tropical Meteorology (IITM)** in Pune, which will significantly advance research in this field.

Mission Mausam

About

- **Launched in September 2023**, Mission Mausam is designed to improve weather prediction and understanding in India.
- The mission employs advanced observation networks, better weather models, and cutting-edge technologies such as **artificial intelligence (AI)** and **machine learning** to improve forecasting capabilities.
- **Nodal Ministry**: Ministry of Earth Sciences (MoES).

Objective

- **Improving Weather Prediction Accuracy**: Using advanced technology, Mission Mausam aims to deliver highly accurate, real-time weather and climate forecasts.
- **Strengthening Climate Resilience**: The mission seeks to equip citizens, last-mile users, and other stakeholders to better handle extreme weather events and climate change impacts.
- **Enhancing Capacity in Weather Sciences**: Through focused research and development, Mission Mausam will improve India's capabilities in atmospheric sciences, including weather modeling, forecasting, and real-time surveillance.

Focus Areas

- **Monsoon Forecasts**: Enhanced predictions for the monsoon season, essential for agriculture and water management.
- **Air Quality Alerts**: Providing accurate forecasts to manage air pollution effectively.
- **Extreme Weather Events**: Timely alerts for cyclones, floods, and other extreme weather conditions.
- **Weather Interventions**: Developing techniques to manage fog, hail, and rain, minimizing disruptions in daily life and business.

Implementing Institutions

- **India Meteorological Department (IMD)**: Responsible for daily weather forecasts and warnings.
- **Indian Institute of Tropical Meteorology (IITM)**: Focused on tropical weather and climate research.
- **National Centre for Medium-Range Weather Forecasting (NCMRWF)**: Specializes in medium-range weather forecasts.
- These institutions work alongside other **MoES bodies** like the **Indian National Centre for Ocean Information Services (INCOIS)**, **National Centre for Polar and Ocean Research (NCPOR)**, and **National Institute of Ocean Technology (NIOT)**.

Cloud Chamber Under Mission Mausam

About

- India is building a **state-of-the-art cloud chamber** at IITM Pune to study Indian **monsoon clouds** in detail.
- The cloud chamber will simulate cloud formation by injecting water vapor and aerosols while controlling temperature and humidity.
- Unlike simpler cloud chambers elsewhere, India's facility will include **convective properties**, essential for understanding monsoon clouds.
- This advanced setup will allow scientists to study the formation of **cloud droplets and ice particles**, with few similar chambers globally.

Why is India Building a Convective Cloud Chamber?

- **Cloud physics** research focuses on the behavior of clouds, such as particle interactions, rain droplet formation, and the effects of atmospheric moisture added by cyclones or low-pressure systems.
- By establishing a **convective cloud chamber**, India aims to improve its understanding of these processes in conditions specific to Indian weather patterns.
- The chamber's **controlled environment** will allow researchers to manipulate parameters like temperature, humidity, and convection, providing a clearer picture of monsoon cloud behavior.
- This knowledge will help India develop **strategic plans for weather modification**.

India’s Experience with Cloud Seeding

- India has previously conducted the **Cloud Aerosol Interaction and Precipitation Enhancement Experiment (CAIPEEX)**, a decade-long program focused on **cloud seeding** to enhance rainfall.
- The final phase (2016-2018) took place in **Solapur, Maharashtra**, where cloud seeding was tested in rain-shadow regions.
- Results showed a **rainfall increase of up to 46%** in certain locations and **around 18%** in a 100 sq. km area downwind from the seeding site.
- Despite these positive outcomes, experts acknowledge that **cloud seeding is not a**

complete solution to India's rainfall challenges.