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Grounding of Aircraft Affects Weather Forecasting

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Why in News

Beginning mid-March, India began restricting incoming international flights into the country and by March 24 had imposed a total shutdown on domestic air travel as well to contain the spread of **Covid-19**.

- The grounding of India's civilian aircraft has strangled a key source of weather data that the **India Meteorological Department (IMD)** uses for its forecasts.
- Officials from the IMD, however, have clarified that India's annual monsoon forecast system is on track, with the first forecast scheduled to be issued in mid-April.

A major factor for gauging the performance of the monsoon is the **El Nino**, a warming of the ocean waters in the equatorial Pacific Ocean. This data is measured by observational data buoys located in the sea and relayed via satellite. This **data is not impacted so far**.

Key Points

- **Aviation and Weather Data:**
 - Aircraft **relay data about temperature and wind speed** in the upper atmosphere to meteorological agencies the world over and this is used in the dynamical models.
 - Input from aircraft is important for the dynamical models as it determines the **initial conditions** for these models.
 - Aviation-generated data is also helpful to warn of **developing thunderstorms or swings in temperatures** that often begin at the heights aircraft traverse.

- **Dynamical model:**
 - Dynamic models are generally models that contain or depend upon an **element of time, especially allowing for interactions between variables over time.**
 - These stimulate the state of the atmosphere and oceans at a particular time and then extrapolate into the future using standard laws of physics.
 - These models are run on **supercomputers** and are relied on to give weather forecasts three days, or even two weeks ahead.
- **IMD will move to traditional weather forecasting system:**
 - This year, the IMD will likely rely on its traditional statistical forecast system, the one developed on the basis of historical data.
 - However, even this will be difficult due to shortage of manpower in the Department owing to Covid-19.
 - The IMD issues its first forecast for the June-September monsoon in April and updates it in June.

India and Weather Forecasting Model

- **Traditional Model:**
 - **Until 2010**, the IMD used **only statistical models** to forecast the monsoon.
 - These **involved identifying climate parameters** linked to the performance of the monsoon. For example, the sea surface temperature gradient between North Atlantic and North Pacific, the volume of warm water in the equatorial Pacific, the Eurasian snow cover.
 - Their values in February and March are correlated to values of actual rainfall over a hundred years and then, using statistical techniques, extrapolated to forecast a particular year's monsoon.
 - This has, however, proved wrong and the **IMD missed its mark on forecasting** major droughts and rain-deficits particularly 2002, 2004 and 2006.
 - The IMD responded by finding new parameters but keeping the technique the same.

- **Dynamic Model:** IMD started testing a dynamical system around 2015.
 - This **simulates the weather at a chosen set of locations on a given day** — the land and ocean temperature, moisture, wind speeds at various heights, etc — and **powerful computers** calculate how these weather variables will change over days, weeks, months.
 - It's able to do this by solving physics equations that show how each of these weather variables is related to each other.
 - The IMD and several private weather agencies are increasingly relying on more sophisticated and high-resolution computer models to give localised forecasts, or warn farmers of changes in weather 10-15 days ahead.
 - Rather than long-range forecasts that only give a broad tenuous picture of the likely performance of the monsoon, the shorter forecasts are far more reliable and help farmers make decisions about sowing.
 - These models are also useful for **anticipating heat-wave or a cold-wave** and therefore useful to urban planners and government.
 - Though meteorological agencies around the world are shifting to such techniques, they still aren't considered entirely reliable for forecasting the monsoon.
 - Further, **India's dynamical model is still not as adept** as meteorologists want them to be, for **warning of a drought or extreme changes in monsoon rainfall.**

India Meteorological Department

- IMD was **established in 1875.**
- It is an agency of the **Ministry of Earth Sciences of the Government of India.**
- It is the principal agency responsible for **meteorological observations, weather forecasting and seismology.**

Source: TH