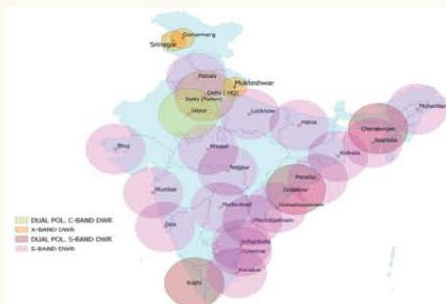


HISTORICAL BACKGROUND

India Meteorological Department adopted radar technology for meteorological applications in the early 50s. The first indigenously designed and manufactured X-band storm detection radar was installed in 1970 at New Delhi.

The first S-Band cyclone detection radar became operational at Visakhapatnam in 1970 and the first indigenous S-Band cyclone detection radar was commissioned in Mumbai in 1980.



Existing radar network of India Meteorological Department.

RADAR NETWORK

IMD's network consists of 26 DWR radars comprising of 21 S-band Radars (DWRs), 02 C-band Radars and three X-band DWRs.

Out of 26 Doppler Weather Radars in the network, IMD has S-band DWRs at Chennai, Kolkata, Machilipatnam, Visakhapatnam, Paradip, Hyderabad, Nagpur, Patna, Lucknow, Patiala, Karaikal, Bhopal, Agartala, Mohanbari, Delhi (Palam), Bhuj, Mumbai, Gopalpur, Kochi, Sriharikota (SHAR), Goa, C-band DWRs installed at Delhi (HQ), Jaipur, and X-band DWRs at Srinagar, Mukteshwar and Sonamarg.

Among the above IMD has indigenous Doppler Weather Radar at Sriharikota (AP) Bhuj & Mumbai, three dual polarised S-band DWRs at Kochi, Gopalpur, SHAR and two X-band dual polarized DWRs at Mukteshwar and Sonamarg.

In the network, twenty S-Band radars are with single polarisation technology.

There are three S-band, two C-band, three X-band radars operating with dual polarization technology.

Radars operating in the X-band are having Solid State Power Amplifier (SSPA) technology for power amplifier in the transmitter.



भारत मौसम विज्ञान विभाग India Meteorological Department

1875 में स्थापित
(Established in 1875)

पृथ्वी विज्ञान मंत्रालय
Ministry of Earth Sciences

भारत सरकार
Government of India

Upper Air Instrument Division



Main units of Upper Air Instrument Division are:

1. RadarLab
2. Upper Air Lab (UAL)
3. Workshop
4. Supply Section
5. Hydrogen Factory (HF) Agra



UPCOMING RADARS OF IMD

RADAR is the essential tool for weather surveillance in IMD which provides in depth information about clouds, spatial distribution of rainfall, gusts and associated phenomena in severe weather events due to thunderstorms, hailstorms and tropical cyclones.

The radar network of IMD includes various S-band, X-band and C-band Doppler weather radars for providing weather forecasts and climate services resulting in public safety & socio economic benefits also support to various agencies



Fig 1: X- Band DWRs

Under Integrated Himalayan Meteorology Project, IMD has planned to install ten X-band DWRs in Northwest and central region of Himalayas to cover the hilly range of J&K, Ladakh, H.P. and Uttarakhand at ten locations as in Fig.1.

Out of ten two DWRs have already been installed at Mukteshwar and Sonamarg in 2020.

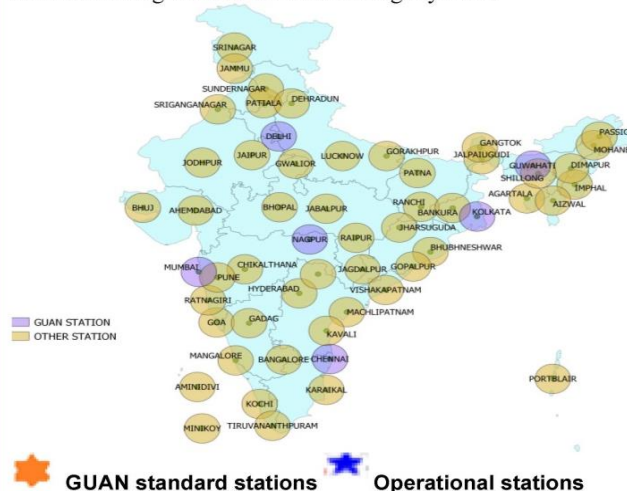
IMD has planned to install eleven C-band DWRs at Malda, Bangalore, Mangalore, Port Blair, Kavaratti, Sambalpur, Balasore, Raipur, Ranchi, Ratnagiri and Ahmedabad as in Fig.2



Upper Air Observational Network

A. Radiosounding Radiowind (RS/RW) network:-

As a part of global observing system (GOS) network of WMO, India Meteorological Department (IMD) has 56 operational Radiosonde/radiowind stations in their upper air network. These stations are engaged in taking the radiosounding observations twice a day at 0000 UTC and 1200 UTC hours. Upper Air Observations are used to measure the vertical profile of the Atmosphere viz Temperature, Pressure, Humidity, Wind Speed Direction using balloon borne soundings systems.



These data sets are basis for the preparation of the upper air climatology, short period averages and climatological research to normals of the seasons. The data collected is used on real time operational forecasting, and research and development of forecasting. These data sets are required for defining the initial conditions for NWP modeling, hence the backbone of the weather forecasting system. The data also shared with Indian Navy, Indian Force & DRDO etc.

B. Pilot Balloon (PB) network:-

62 stations in the upper air network of IMD having pilot balloon observations. Pilot Balloon Observations are used to measure the upper air wind speed and direction. The balloon is tracked using an optical theodolite. These observations are made every synoptic hour.



In the upper air domain of GCOS, aiming on further improvement of upper air data quality, IMD established GUAN standard radiosounding observations at its 5 Regional Meteorological Centres (New Delhi, Mumbai, Kolkata, Chennai, Guwahati and Nagpur). The performance of these stations was presented at WMO Technical Conference on Instruments and Methods of Observations (TECO-2016) and a formal claim was made to Secretary General WMO for inclusion of these stations into the GCOS Upper Air Network (GUAN). Based on the sustained performance these stations have been included in the WMO- GUAN standard network by GCOS Secretariat, and their performance indicators figures in the summary of NOAA's monthly report with effect from June 2017 on regular basis.

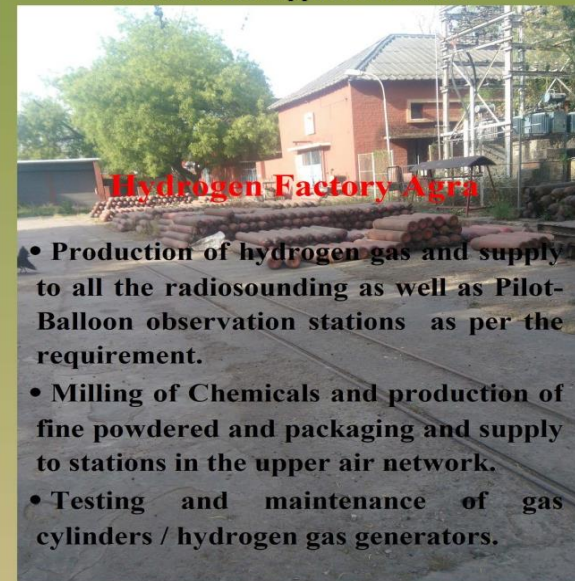
Radiosounding System Antenna

IMD Workshop, New Delhi

- Production of GPS based pilot-sonde.
- Production of gas filling sets, FA valves, Nozzles, weights etc.
- Maintenance work required in Radar, radiosondes etc.
- Balloon release programme on Republic Day Parade and Independence Day Celebrations.

Supply Section

- Logistic support to all the radiosounding as well as Pilot-Balloon observation stations.
- Procurement of Chemicals for HF Agra.
- Arrangement of transport of chemicals and Hydrogen gas cylinders from HF Agra to various stations in upper air network.



- Production of hydrogen gas and supply to all the radiosounding as well as Pilot-Balloon observation stations as per the requirement.
- Milling of Chemicals and production of fine powdered and packaging and supply to stations in the upper air network.
- Testing and maintenance of gas cylinders / hydrogen gas generators.

C. Projects:-

- Continuation of operational upper air radiosounding network to its optimum level.
- Sustenance of WMO GUAN standard upper air network, and further expansion from 6 to 12.
- Production of GPS based pilot-sondes in IMD workshop.
- Up-gradation of pilot balloon (PB) stations by using state of the art fully automatic pilot sonde system.
- Further densification of operational upper air network.