# Country Report

## India Meteorological Department


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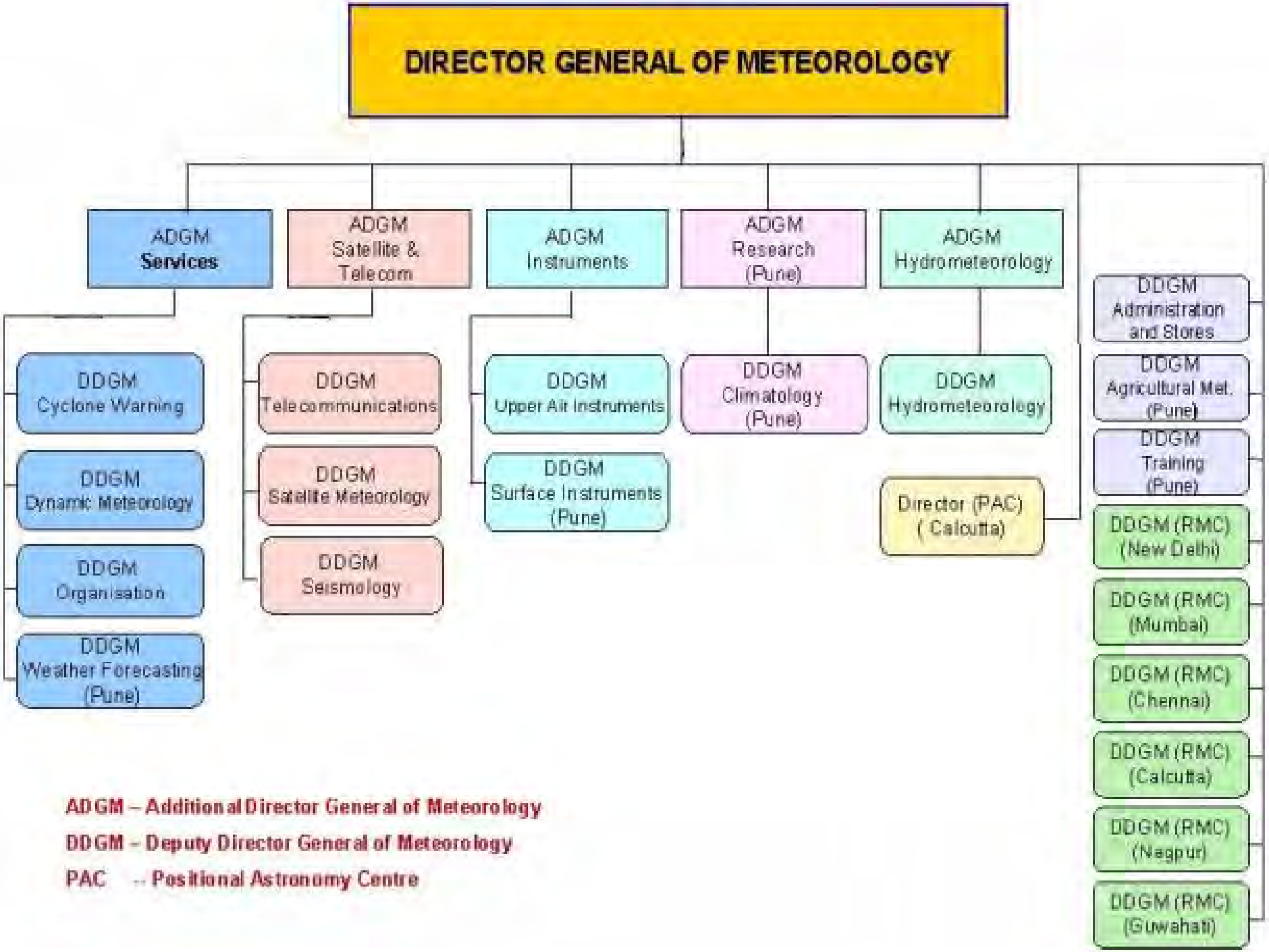
India Meteorological Department

Pune

# Historical facts

- **Modest beginning in 1875**
- **Progressively expanded its infrastructure for meteorological observations, communications, forecasting and weather services.**
- **It has achieved a parallel scientific growth.**
- **IMD has always used contemporary technology. In the telegraph age, it made extensive use of weather telegrams for collecting observational data and sending warnings.**
- **IMD became the first organisation in India to have a message switching computer for supporting its global data exchange.**
- **One of the first few electronic computers introduced in the country was provided to IMD for scientific applications in meteorology.**
- **India was the first developing country in the world to have its own geostationary satellite, INSAT, for continuous weather monitoring of this part of the globe and particularly for cyclone warning.**

# Organisational Structure




ADGM – Additional Director General of Meteorology

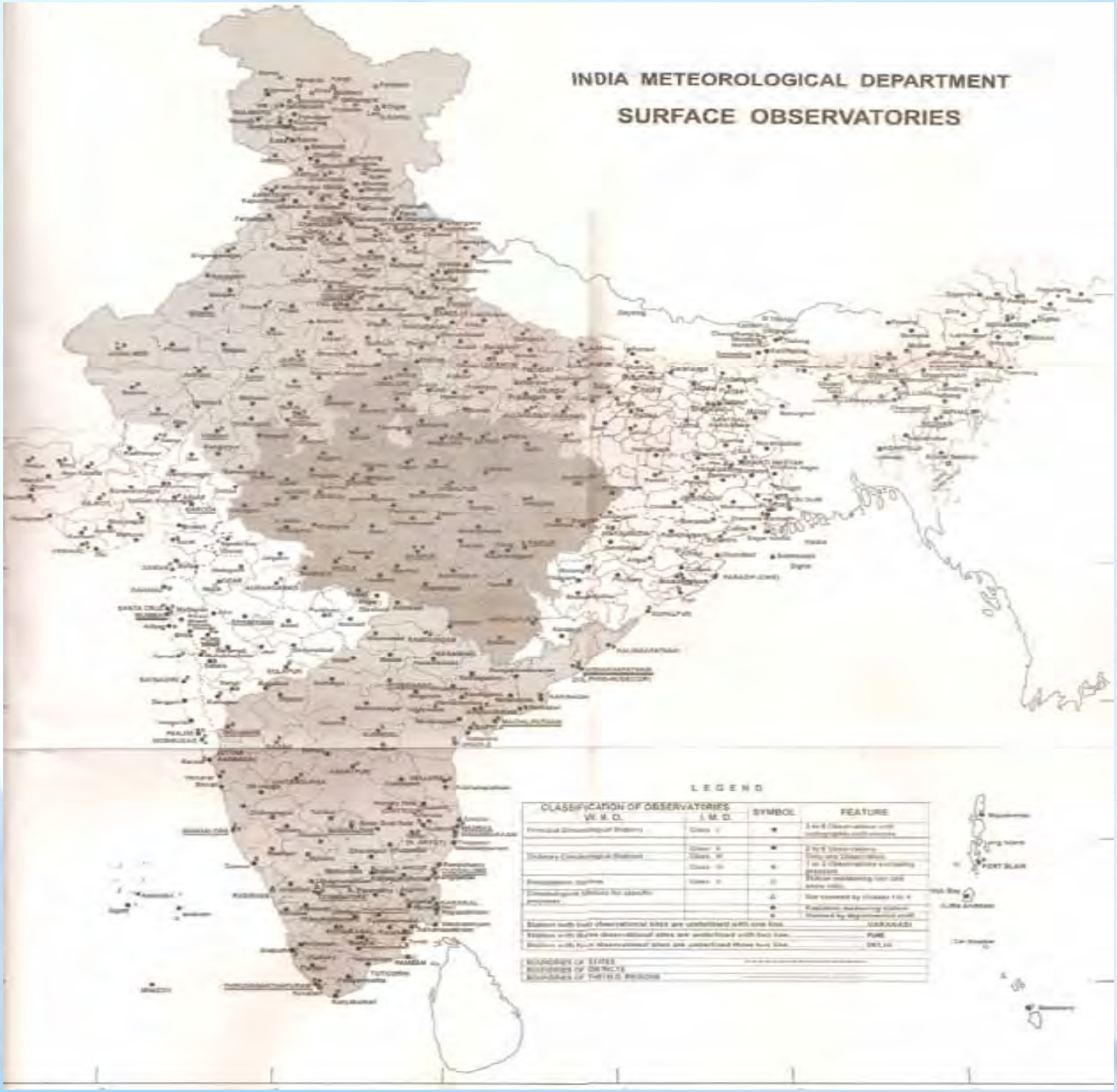
DDGM – Deputy Director General of Meteorology

PAC -- Positional Astronomy Centre

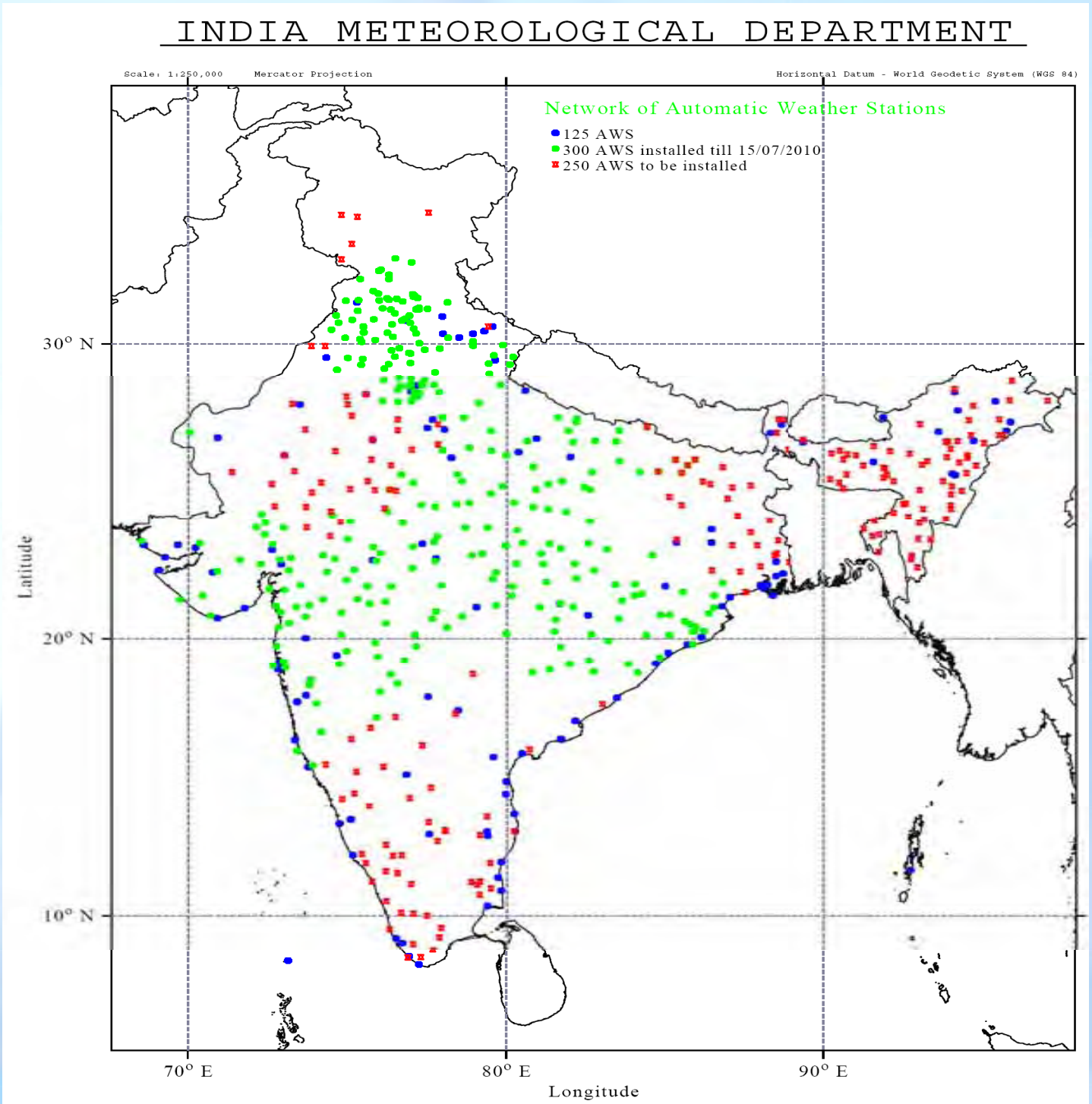
# (All instrument certified and maintained by IMD)

| Type of observa-tories | No. of observatories | | Total No. of observa-tories | No. of Syn. Obsn. & Reporting |
|---|---|---|---|---|
| | Depart-mental | Non-depart-mental | | |
| Class I | 144 | - | 144 | 4 or 8 observations daily<br>Communicating in real-time |
| Class II | 55 | 276 | 331 | 2 observations daily<br>Communicating in real-time |
| Class III | Nil | 02 | 02 | one observations daily<br>Communicating in non-real-time bi-monthly |
| Class IV | Nil | 10 | 10 | 0ne-two sets of obsn except Pressure<br>Communicating in non-real-time monthly |
| Class V | Nil | 213 | 213 | Daily-Rainfall observation<br>Communication daily / bi-monthly / weekly |
| Class VI | 03 | 04 | 07 | Obsn. for specific purpose |
| FMO | Nil | 363 | 363 | two rainfall obsn daily<br>Communicating in real-tine |
| EMO | 01 | 06 | 07 | Experimental Met. obsy. |
| Total | 203 | 874 | 1077 | |

# Manned Surface Stations – 628



# AWS Network




**AWS Installation continue**

**Installed:425**
**Planned :675**

**ARG Installation continue**

**Installed:324**
**Planned :1350**

- **About 1700 Raingauge stations operated by state governments**
- **They use data for immediate disaster mitigation due to heavy rain in addition to sharing with IMD**
- **Raingauges are certified by IMD before installation.**

# Upper Air & PB Stations

**Time and frequency of observations**

| | |
|---|---|
| Rawin sonde | -26 |
| GPS Radiosonde | -11 |
| Radiosonde | - 2 |
| Total | -39 |

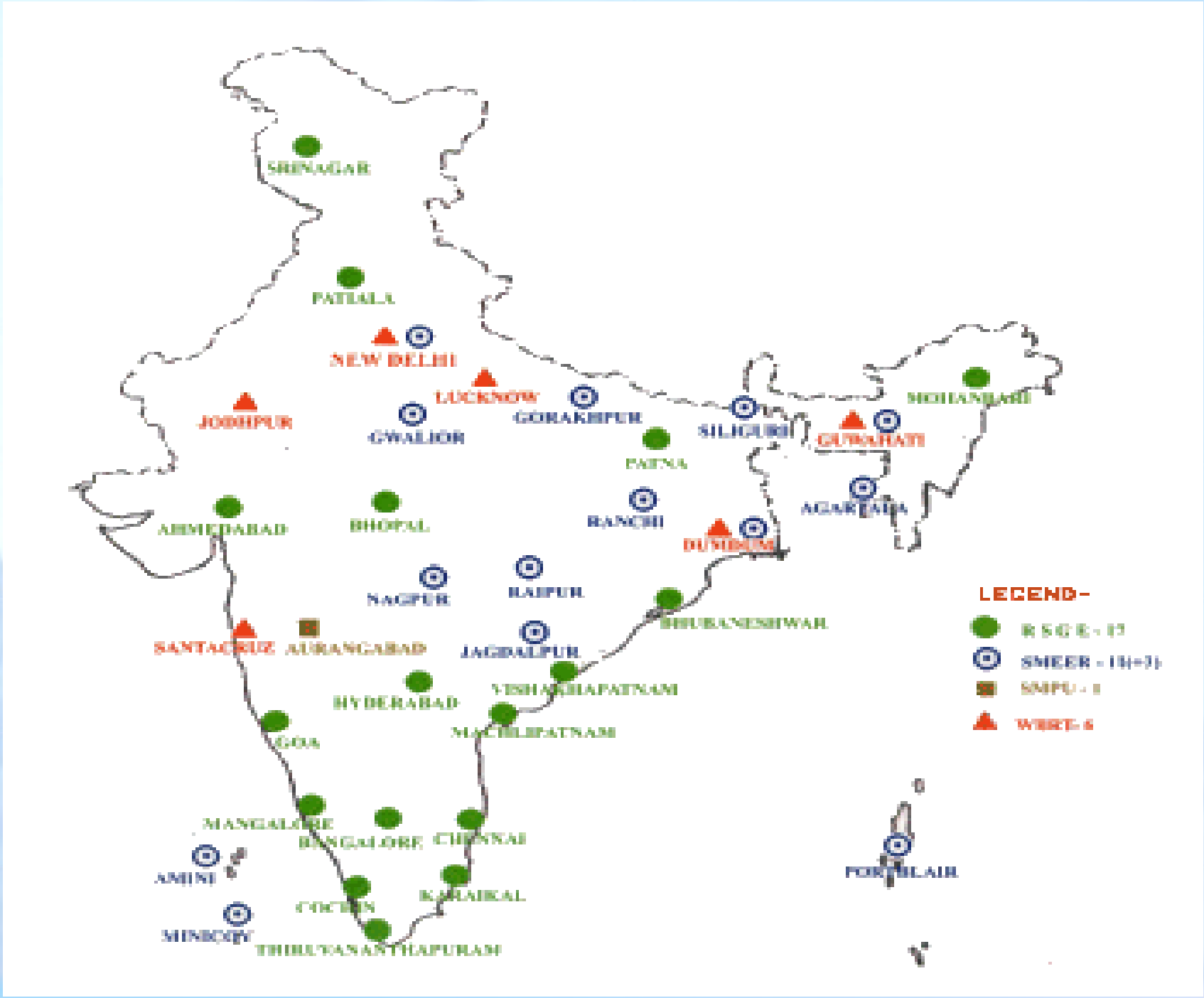
0000 UTC
1200 UTC.

Pilot Ballon -64

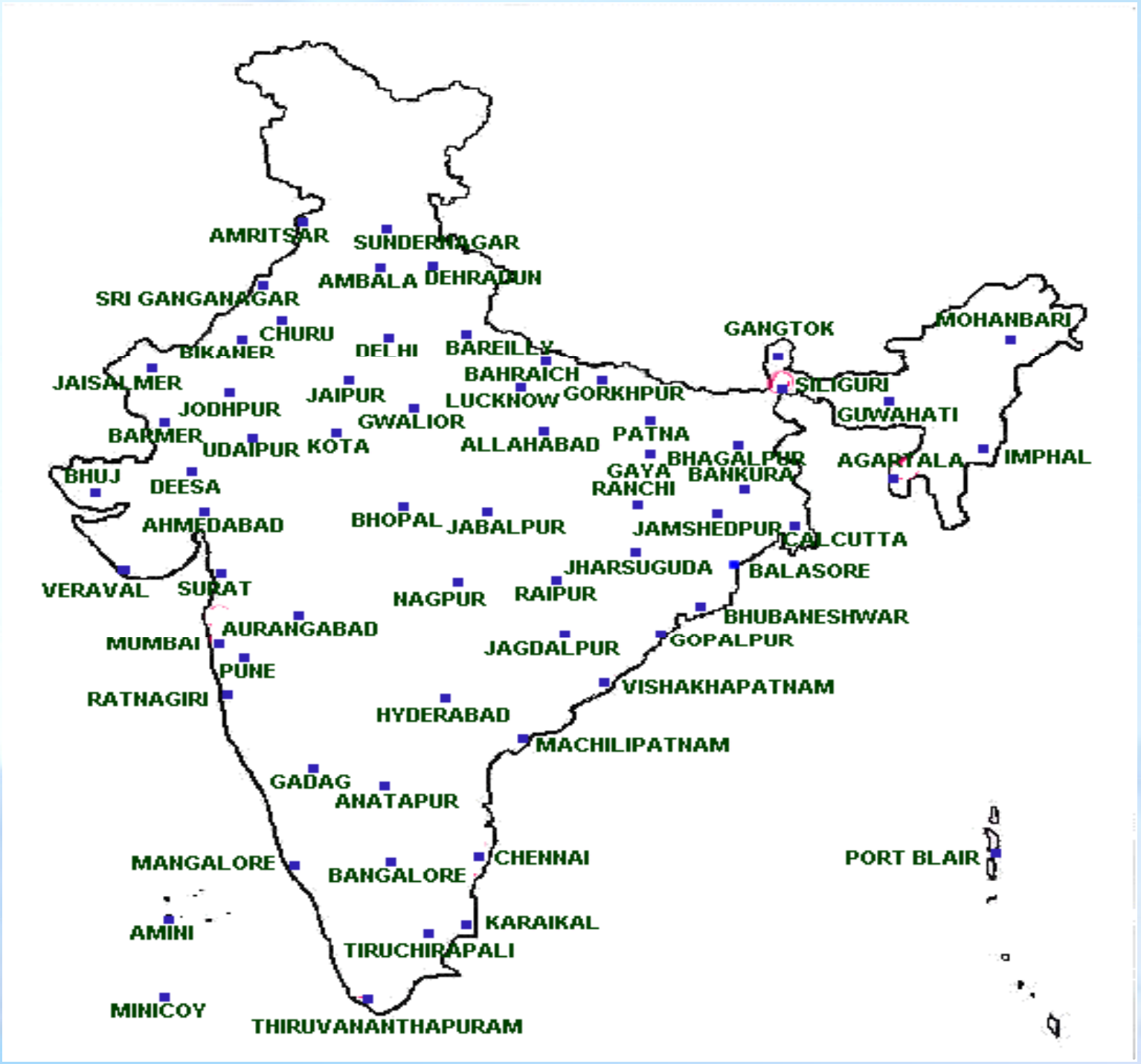
0000 UTC and 1200 UTC where Radiosonde observation not taken

0600 UTC and 1800 UTC where Radiosonde observation are taken

# Upper Air Stations



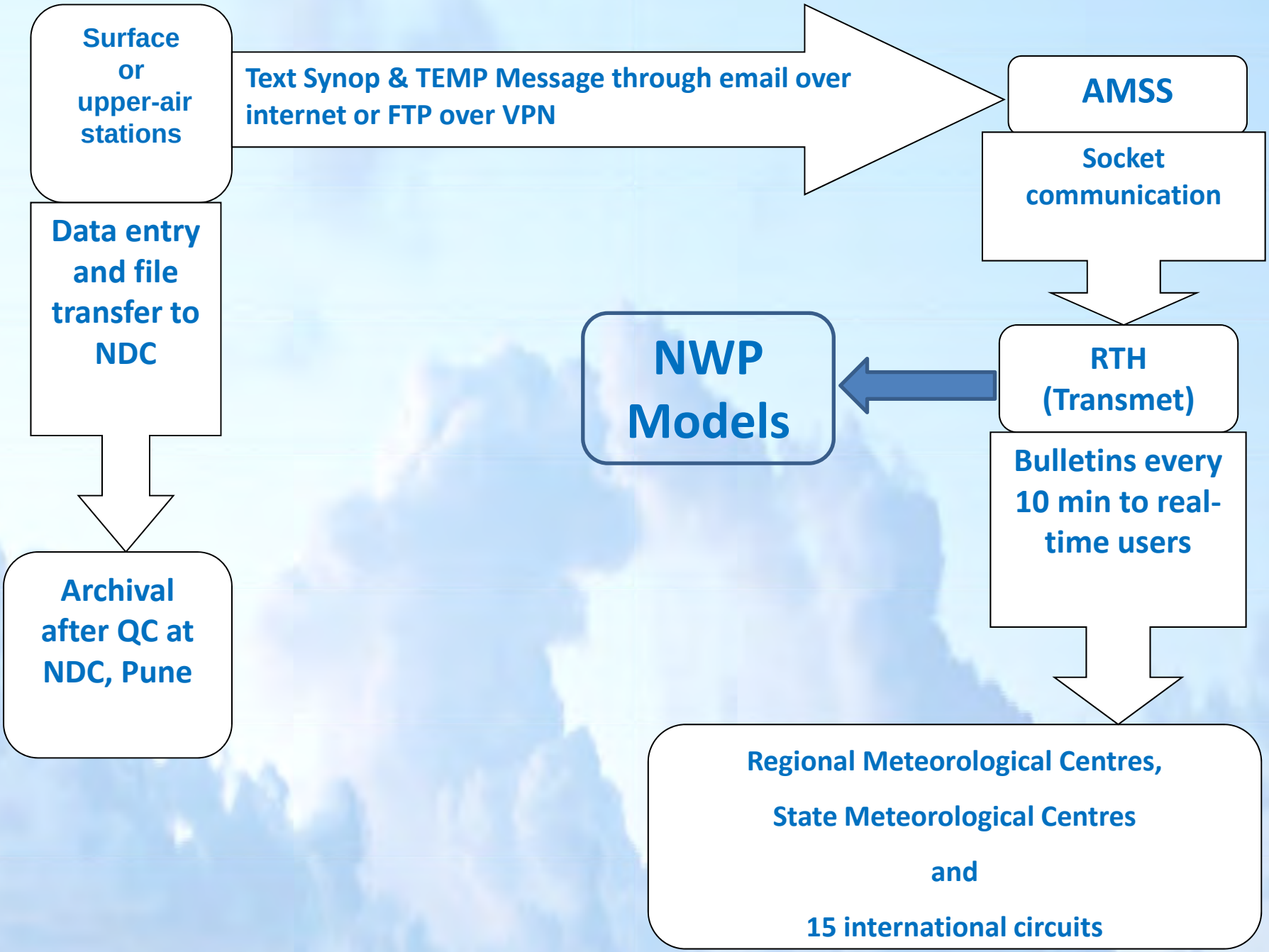
# Pilot Balloon Stations



# Other Observations

- Radiation Observational Network – 45 Stations
- Hydrometeorological Observational Network -705 Observatories
- Aviation Observational Network- 79 Airports
- Radiometer sonde Observational Network- 8 stations
- Ozone Observational Network-
  - Ozone-sonde Observatories – 4 stations
  - Surface Ozone Observatories – 6 stations

# Data flow to users and archives



# Traceability

- India manufacture their own upper-air and surface instruments.
- In-house production facilities at Pune and New Delhi.
- All instruments are calibrated in calibration laboratories at Pune and New Delhi before deployment.
- Calibration Lab. maintains national and working standard
- Calibration lab. has recognition from Bureau of Indian Standard.
- All instruments at surface stations are checked and compared once a year with portable standard.
- Portable standard are traceable to national standards.
- National standards are also regularly compared and calibrated against international /WMO standards.

# Quality Assurance & Quality Control

- Manual QC is applied at manned synoptic station by comparing with long term normals (Averages) at observer's intelligence.
- QC algorithms for AWS is under development
- SYNOP/TEMP messages are checked for proper WMO format at communication centres before forwarding to users.
  - Any message found erratic is flagged for manual correction.
- NWP centre uses NCEP's data assimilation package. This has in-built data filtering mechanism using-
  - Gross value check
  - Horizontal & verticle consistency check
  - Internal consistency check
- NDC uses a suitable software of 10 day moving averages for checking errors in meteorological parameters before archival.
  - Doubtful values are flagged for manual check & correction.

# Training

- The Central Training Institute (CTI) of the India Meteorological Department (IMD) is situated at Pune.
- Training facilities at New Delhi for Upper Air Instrumentation and telecommunication.
- **Facilities for meteorological training at Pune and New Delhi have been recognized by the WMO to function as RMTC**
- Main disciplines-
  - General Meteorology
  - Meteorological instrumentation,
  - Telecommunication
  - Agro-meteorology.

# Current issues

- Cost of Preventive maintenance and spare parts for modern electronic equipments is very high
- Availability of spare parts is limited to its manufacturers, thus increasing dependency on third party services.
- Lack of skilled manpower in-house for maintenance support for modern electronic equipments

- Non-availability of quality monitoring mechanism for AWS and ARG data from large number of stations.
- Poor quality of radiosonde data due to poor accuracy (repeatability) of baroswitch (pressure sensor)

# Future plans

- Development of algorithms and software for automatic quality monitoring of AWS and ARG data.
- Development of indigenous GPS radiosonde
- Network Expansion for all types of measurement

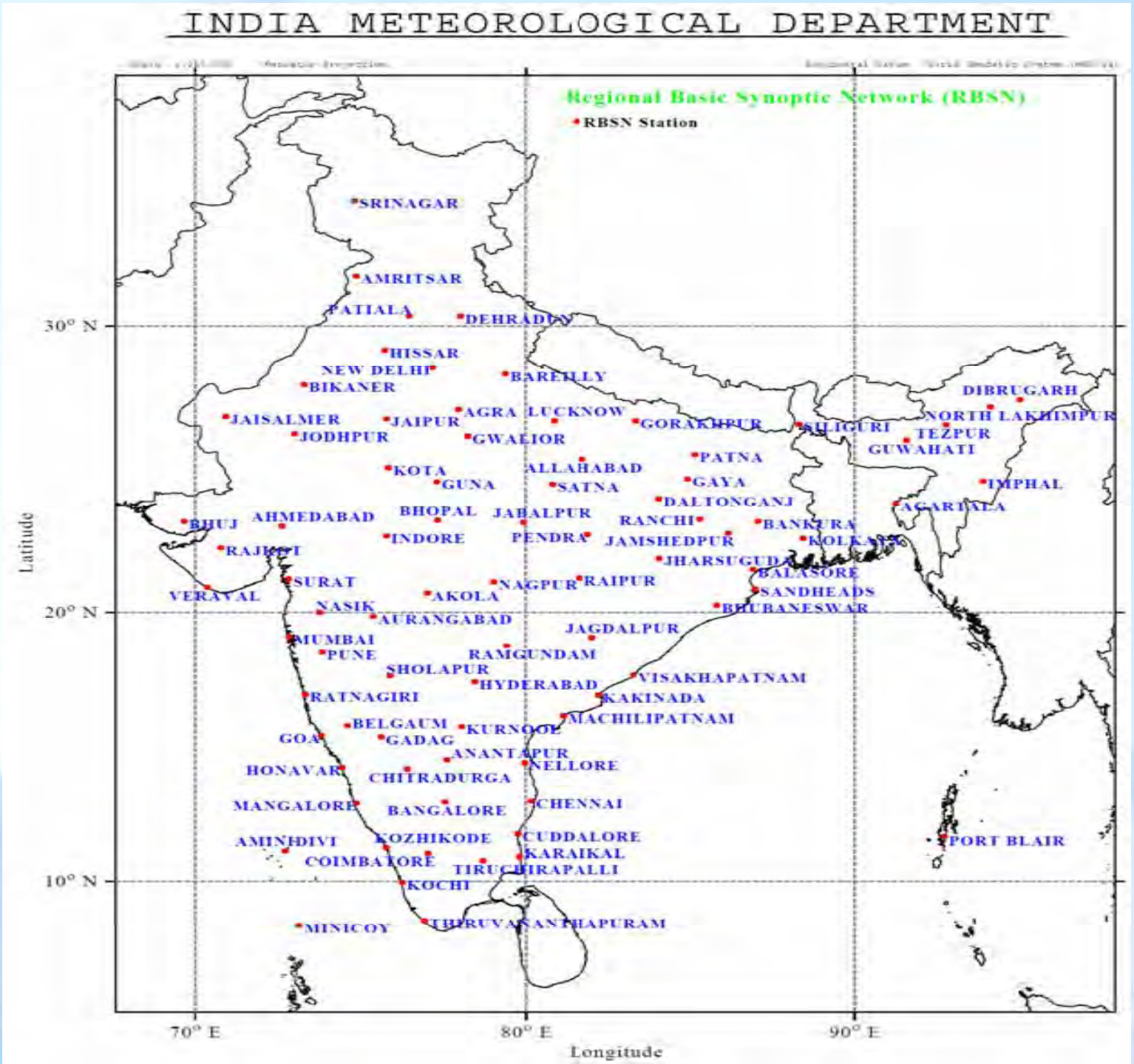
# Suggestions

- Availability about the JMA monitoring reports to be widely publicized.
- AWS data of IMD may also be included in the monitoring reports.

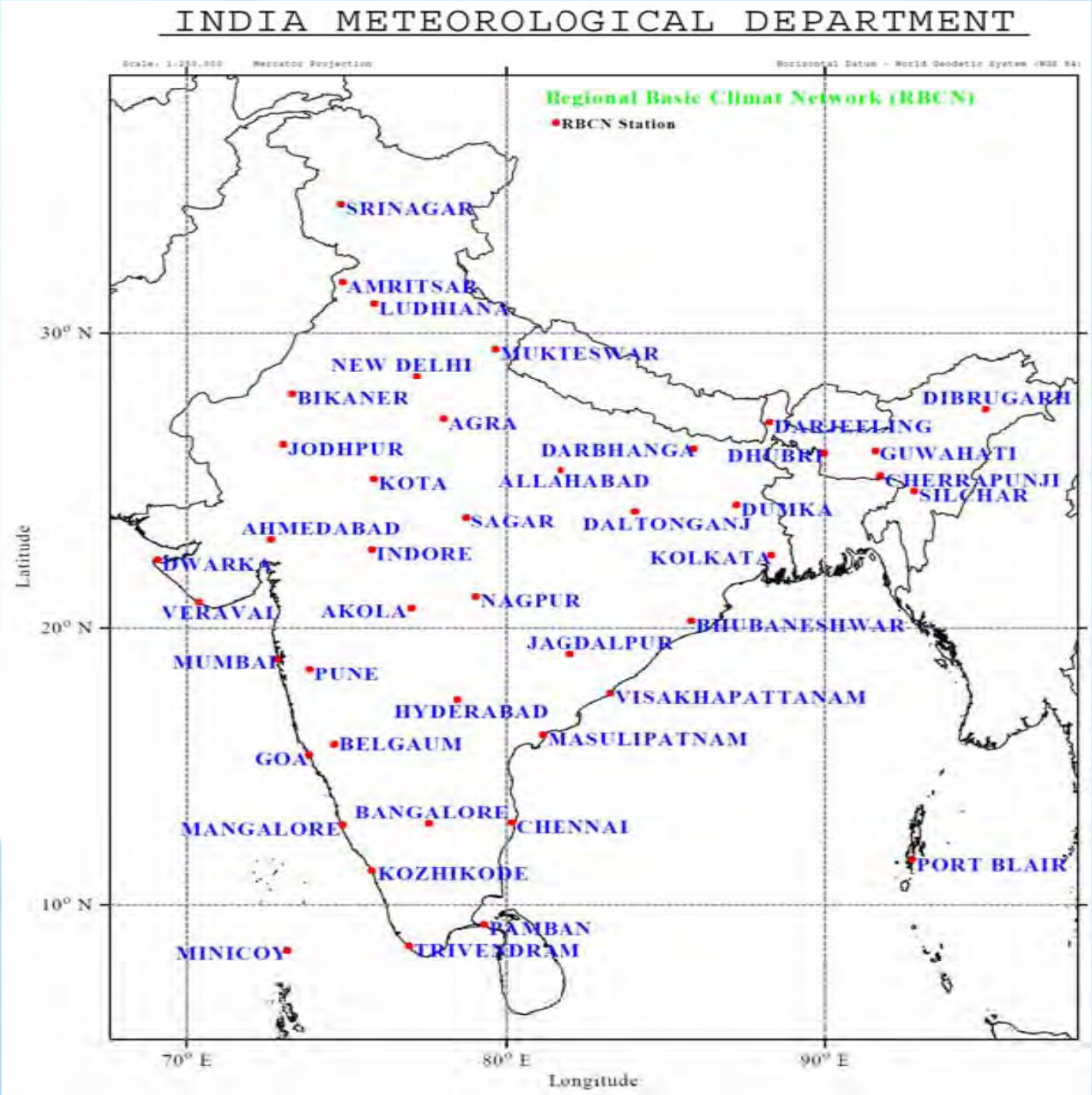
# Thanks

Surface stations

# RBSN Surface stations (32)



# RBCN Surface Stations (44)



# Upper-Air Stations

# RBSN Upper air stations (26)