India

JMA/WMO Workshop on Quality Management in Surface, Climate and Upper-air Observations in RA II (Asia)

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COUNTRY REPORT

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Summary and Purpose of Document

The document is submitted as per the requirement stipulated in the invitation letter for JMA/WMO WORKSHOP ON QUALITY MANAGEMENT IN SURFACE, CLIMATE AND UPPER-AIR OBSERVATIONS IN RA II (ASIA)

The document describes the status of Meteorological Observation in India including quality control, instrumentation, training and other related aspect thereof.

A GUIDE TO WRITING A COUNTRY REPORT AND PRESENTATION

1. Observation networks

1.1 Surface observations

1.1.1 Number of stations: RBSN, RBCN, GSN, manned stations and AWS

Table 1 Number of stations

	RBSN	RBCN	GSN	Manned stations	AWS	ARG
number	82	44	20	528	425 *	324 #

* Further addition in progress. Total planned : 675
** Further addition in progress. Total Planned :1350

1.1.2 Station map

Maps showing locations of the RBSN, RBCN and GSN station : Fig. 1 to 3
Maps showing locations of the manned station and AWS : Fig 4 & 5

1.1.3 Time and frequency of observations

All surface stations included in the regional basic synoptic network take surface observations at the four main standard times of observation, i.e. 0000, 0600, 1200 and 1800 UTC, and at the four intermediate standard times of observation, i.e. 0300, 0900, 1500 and 2100 UTC.

1.1.4 Data flow to users and archives

Illustrated in Fig 9

1.2 Upper-air observations

1.2.1 Number of stations: RBSN, RBCN, GUAN, manned stations and automated system stations

	RBSN	RBCN	GUAN	Manned stations	Automated system stations
number	-	20	-	39	-

1.2.2 Station map

Map showing locations of the RBCN upper-air stations : Fig.6
Map showing locations of all upper-air and Pilot balloon stations : Fig. 7 & 8

1.2.3 Time and frequency of observations

- upper air observations are made and reported at 0000 UTC and 1200 UTC.
- Pilot balloon observations are made and reported at -
    - 0000 UTC and 1200 UTC where Radiosonde observation not taken
    - 0600 UTC and 1800 UTC where Radiosonde observation are taken

1.2.4 Data flow to users and archives

Illustrated in Fig 9

2. Siting and metadata

- Outdoor instruments are installed on a level piece of ground, approximately 10 m x10 metres, covered with short grass or a surface representative of the locality, and surrounded by open fencing. Within the enclosure, a bare patch of ground about two metres by two metres is reserved for observations of the state of the ground and of soil temperature at depths of equal or less than 20 centimetres.
- There should be no steeply sloping ground in the vicinity and the site should not be in a ditch. The site should be well away from trees, buildings, walls or other obstructions. The distance of any such obstacle (including fencing) from the raingauge should not be less than twice the height of the object above the rim of the gauge, and preferably four times the height.
- Metadata consists of station name, latitude, longitude, altitude, height (above ground) of pressure and wind measuring instrument, details of obstruction if any,

3. Instruments, sensors, upgrade, maintenance, instrument intercomparisons and traceability

- India belongs to that select group of countries who manufacture their own upper air and surface instruments. This is done by the meteorological department through in-house production facilities
- All instruments at surface stations are checked and compared once a year with portable standard that are traceable to national standards. National standards are also regularly compared and calibrated against international /WMO standards.
- The maintenance of modern electronic instruments is a matter of concern. Availability of spare part is restricted to its manufacturer and sometime too costly. Lack of skilled manpower for maintenance is another difficulty towards upgrade to modernization/ automation.

4. Quality assurance / quality control (real-time, non-real time)

- 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.
- Suitable software of 10 day moving averages is run for checking errors in meteorological parameters. Doubtful values are flagged for manual correction.
- Hydrostatic quality checks is performed on upper air data at processing centres.

5. Training

- The Central Training Institute (CTI) of the India Meteorological Department (IMD) is situated at a pleasant location at Pashan in Pune. IMD also has training centres at New Delhi for Upper Air Instrumentation.
- Facilities for meteorological training at Pune and New Delhi have been recognized by the WMO to function as RMTC in all the four main

disciplines namely, General Meteorology, Meteorological instrumentation, Telecommunication and Agro-meteorology.

- The training institute (CTI) has been continuously upgrading, keeping pace with technological advancement, its training capabilities, composition, objectives, contents, etc, in catering to personnel covering all levels from Class I to Class IV.

6. Statistics and applications

Application for surface and upper-air observations:

- Weather forecasting
- Climatology
- Agromet advisory
- Civil aviation
- Marine navigation
- Cyclone warning
- Hydrology and flood forcasting
- Environmental monitoring
- Supply of data to various users on demand

7. Current issues and future plan

Current issues:

- 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

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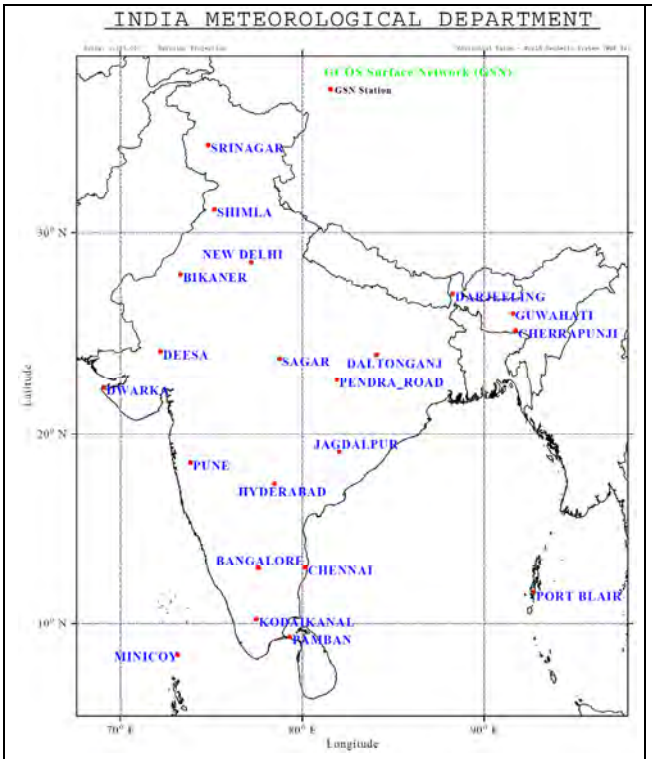

Fig.1 GSN- Surface stations

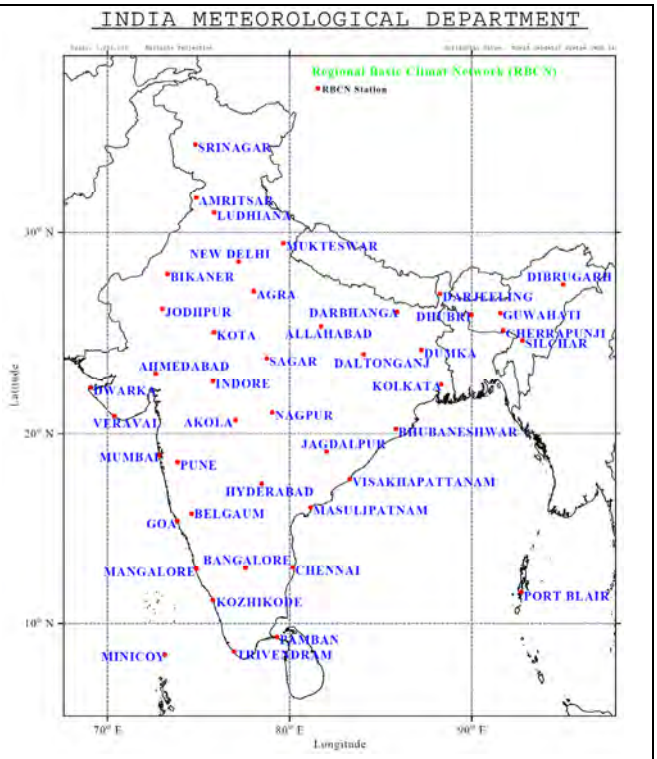

Fig 2 RBCN-Surface stations

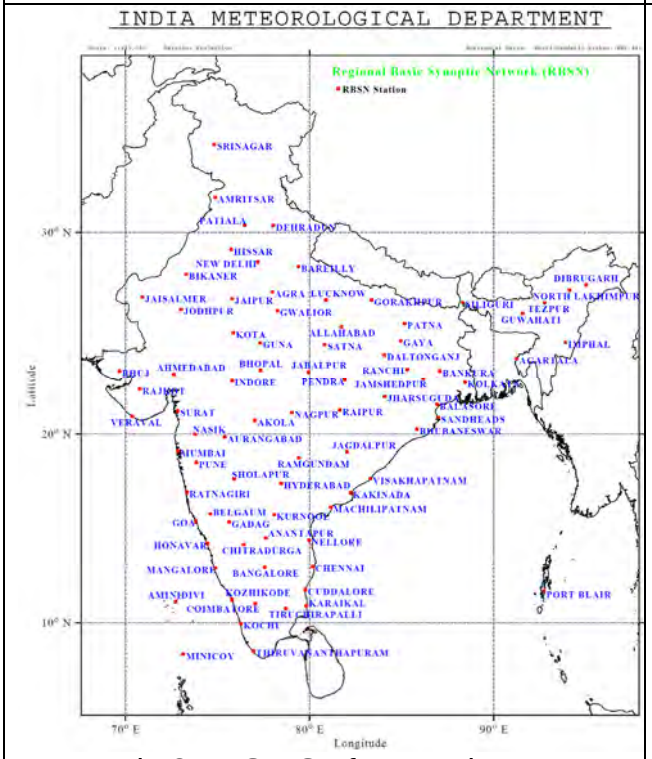

Fig 3 RBSN-Surface stations

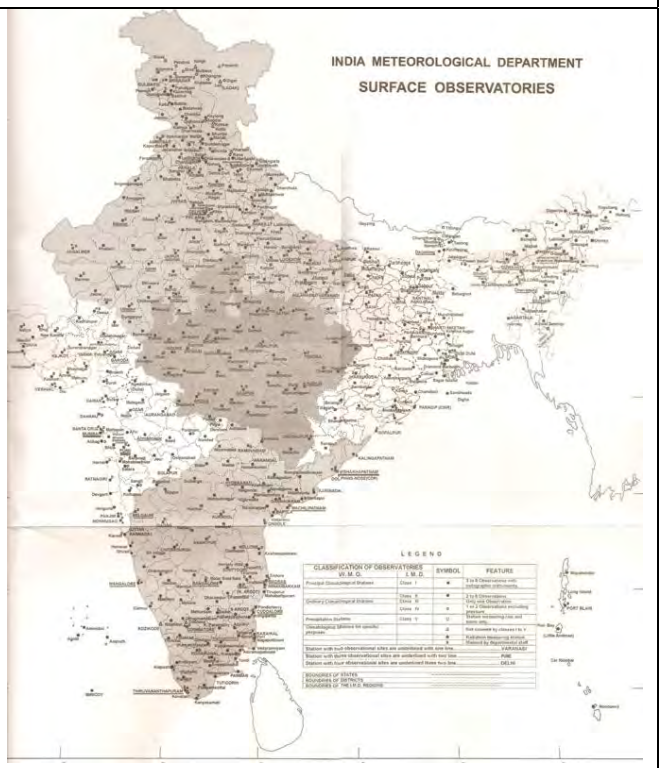

Fig. 4 Manned surface stations

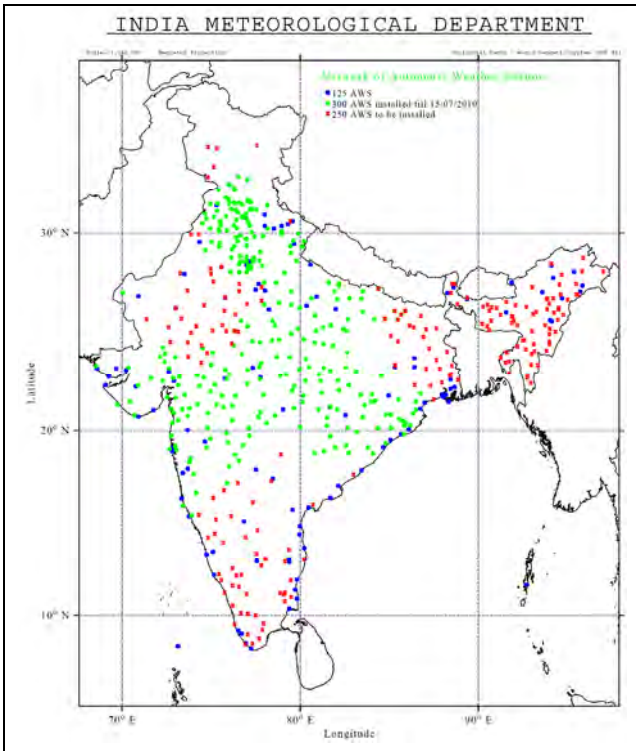

Fig 5 AWS netwirk

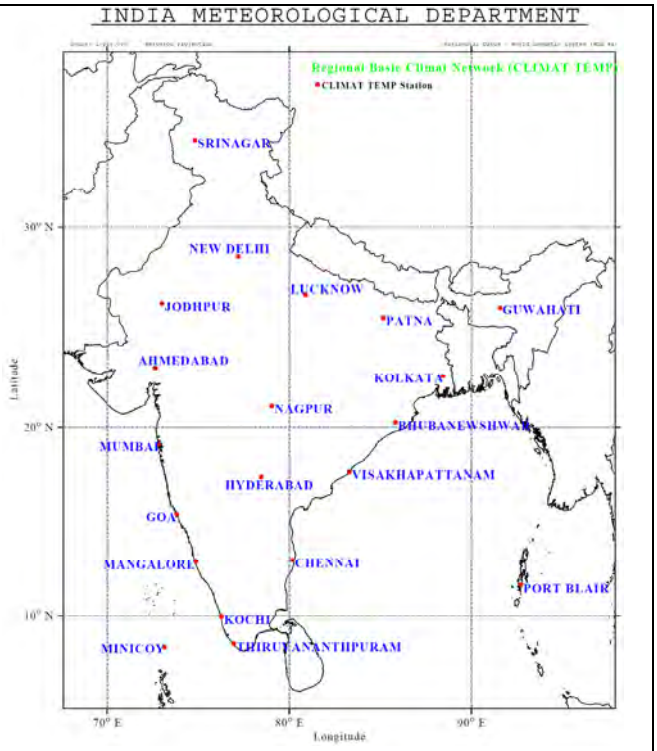

Fig 6 RBCN-Upper-air stations

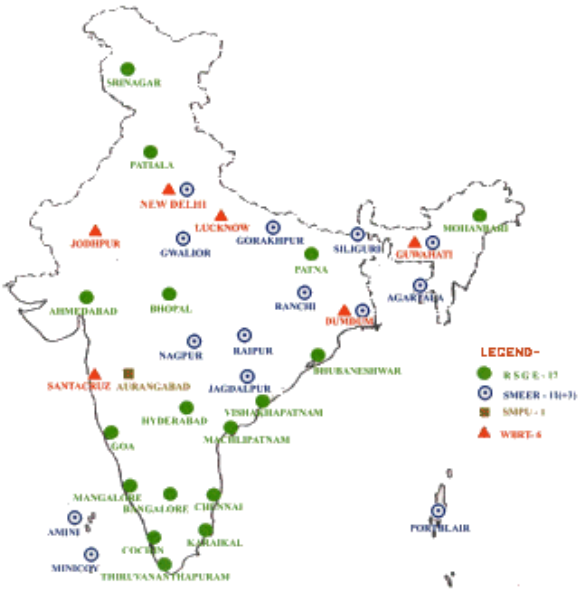

Fig 7. Upper Air Stations

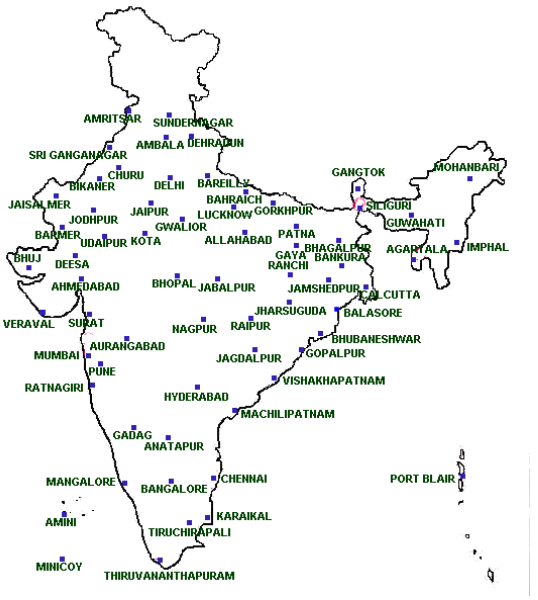

Fig 8. Pilot Balloon Stations

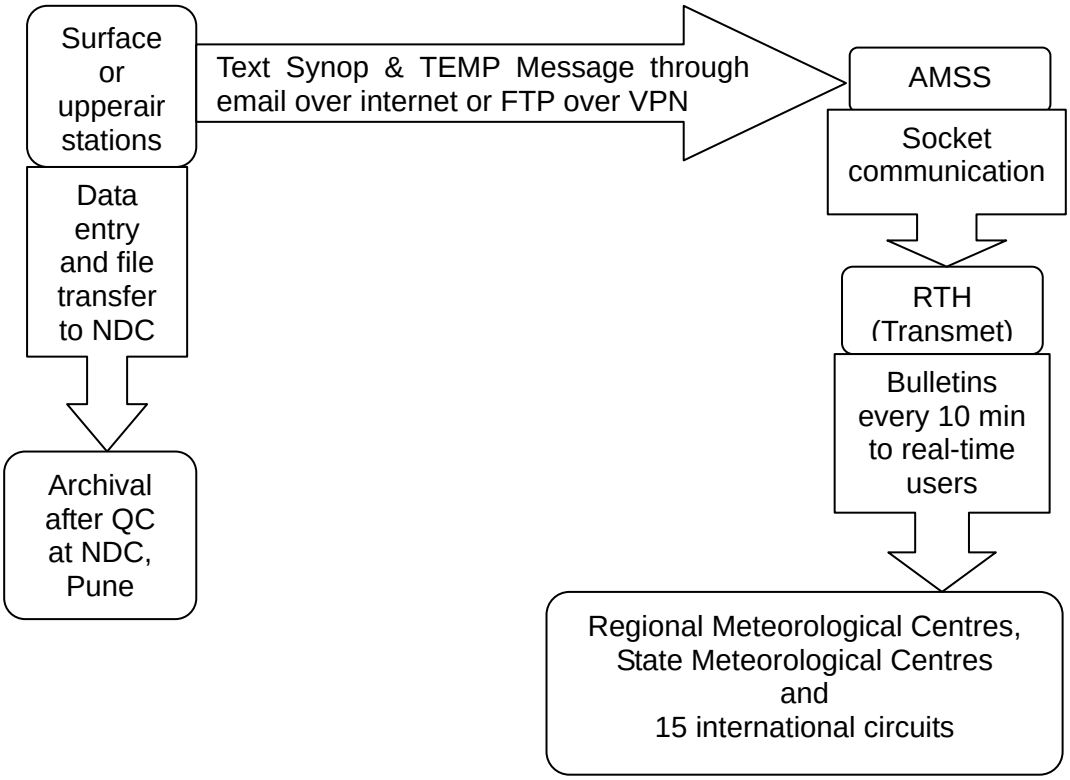

Fig 9 Surface and Upper-air Data flow to users and archives