Standard sensors for atmospheric observation

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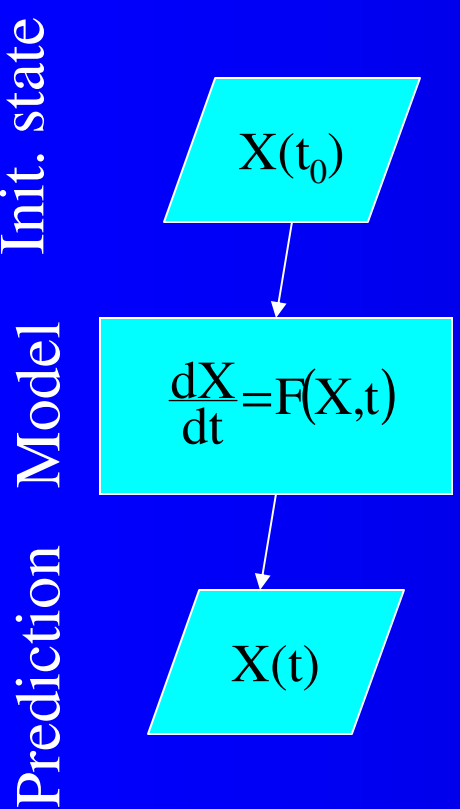
Overview

- Operational versus experimental ?
- The various components of the operational observation network of Météo-France.
- Data availability

Operational vs. experimental

- Experimental observation:
  - Mobile systems to be deployed at specific locations for a limited period of time
  - Real time availability of data not necessary.
  - Unattended operation not required.
- Operational observation
  - Observation systems at fixed locations operating continuously (7/7, 24/24)
  - Strong preference for unattended, automatic systems.
  - (Quasi-) real time availability of data.
  - Permanent archiving.
  - Global coverage through the Global Telecommunication System (GTS)

The use of operational observations by numerical weather prediction models



- The state of the atmosphere at the initial time of the forecast must be given to the model which solves approximately the dynamic equations governing the evolution of the atmosphere.
- The state of the atmosphere at one given time is determined by the ANALYSIS which consists in correcting the state predicted previously by the model according to the newly available observations.
- Analyses are conducted every 6 hours at synoptic times (00, 06, 12 and 18 UTC). Many “synoptic” observation systems deliver data every six hours.

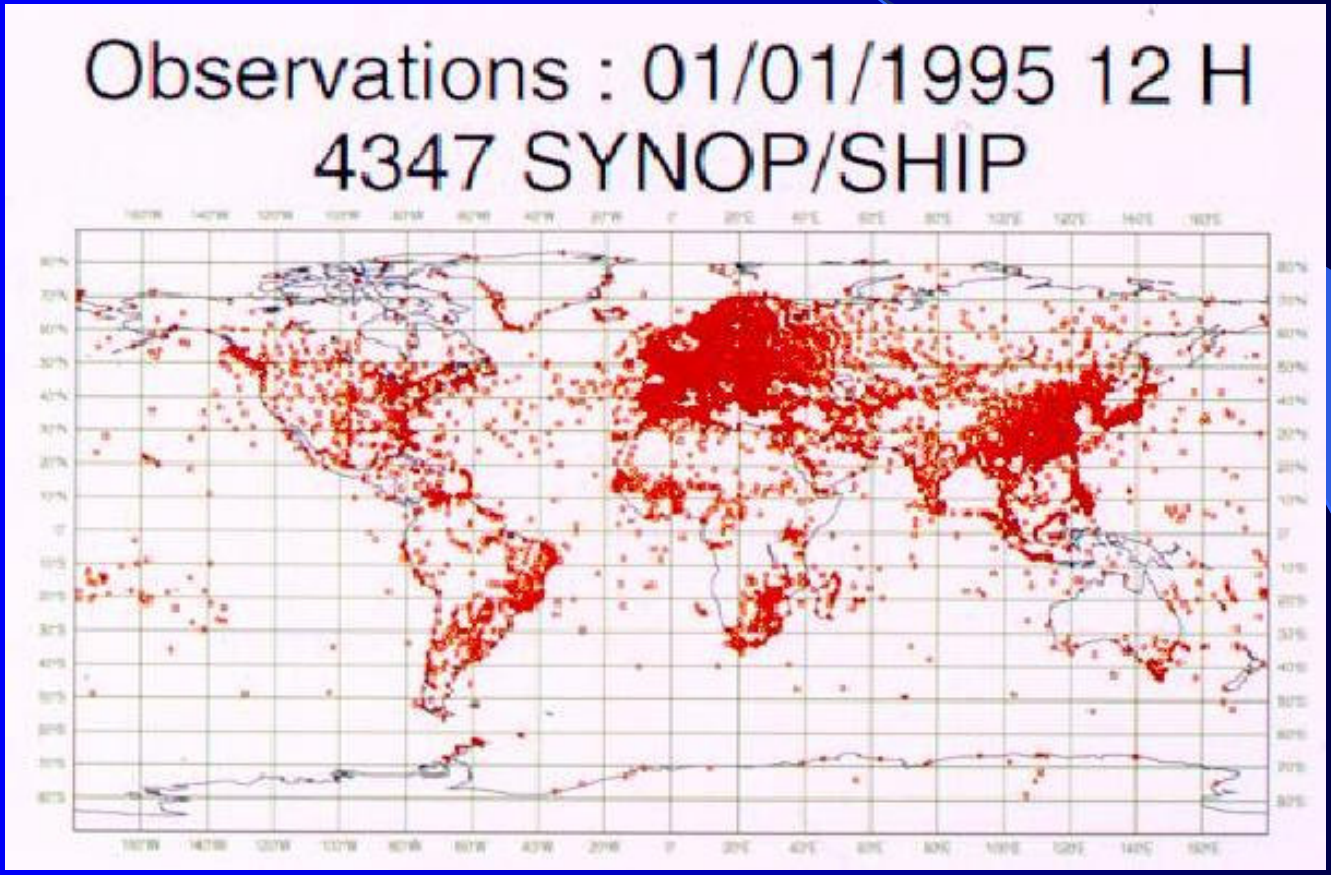
The different components of the operational network

- Surface stations (land/sea)
- Radio-soundings
- Radars
- Airborne sensors

Surface stations (1)

- **Parameters :** Pressure, temperature (2m), relative humidity (2m), wind (10m), rain-rate, up- and down-welling radiation, cloud cover…
- **Repetition rate** : Highly variable ; 1 min to 1hr.
- **Accuracy**: 0.1 hPa, 1K, 1%
- More than 500 stations in France**.**
- **Surface observations** acquired at **sea** on selected ships and moored or drifting buoys.
- **Mobile surface stations** available at CNRM.

Surface stations (2)



SYNOP and SHIP are synoptic messages provided by land and sea surface stations.

Surface stations (3)

Propeller anemometer

Radiometer

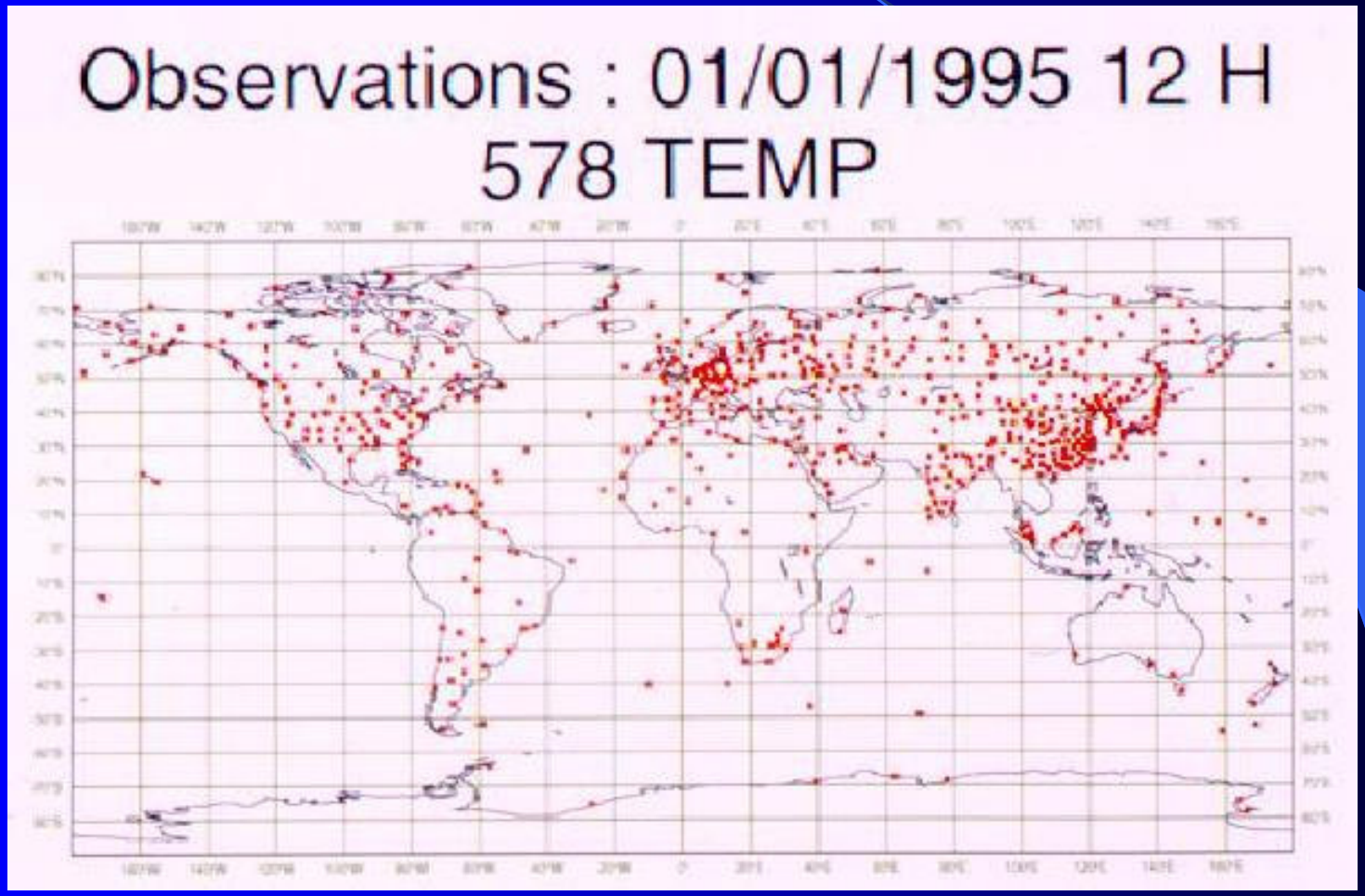
Ventilated shield for temperature and humidity sensors

Ceilometer
(β lidar @ 0.9μm)

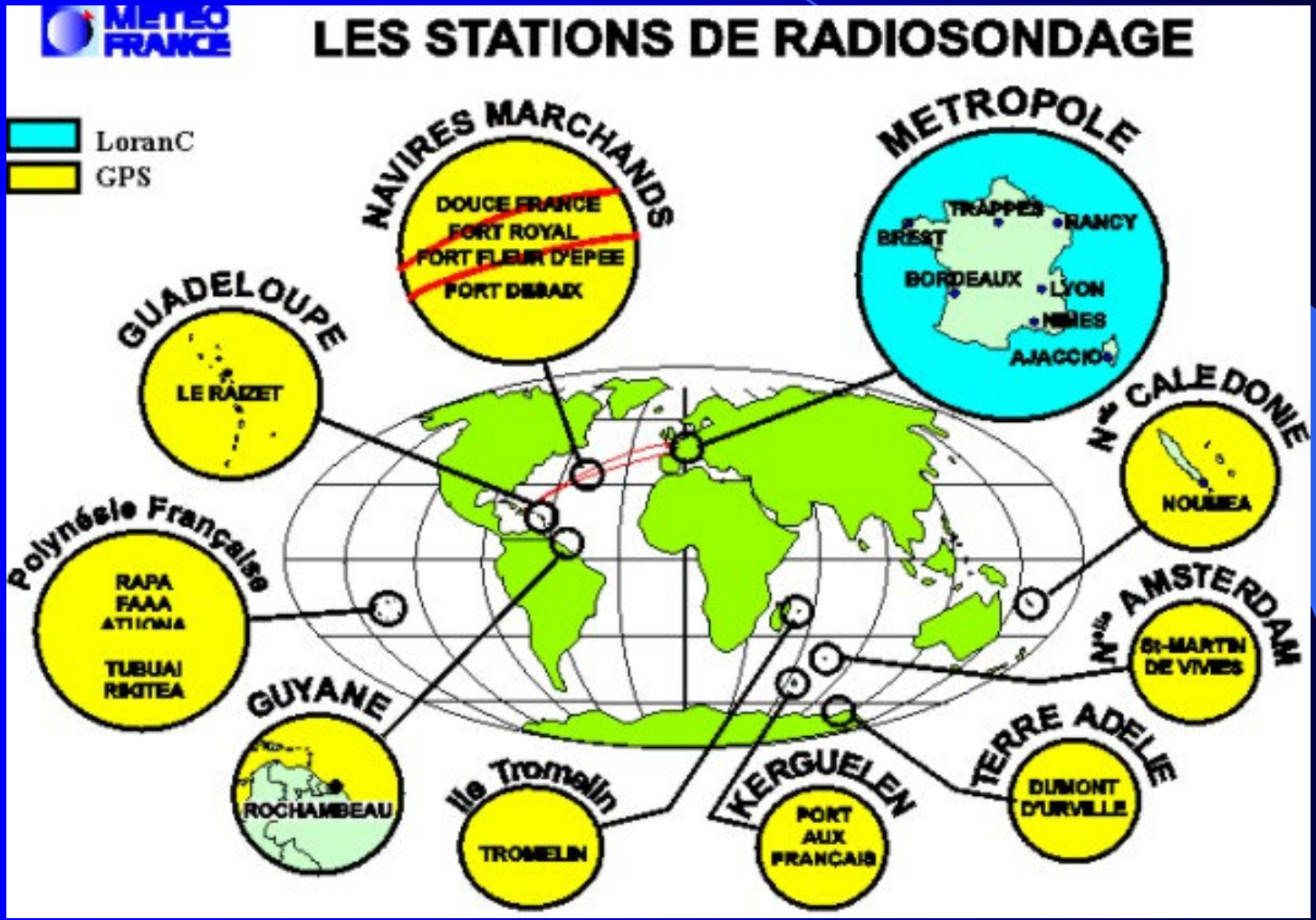
Radio-soundings (1)

- Observations by sondes carried by helium inflated balloons. Data down-linked by radio transmission.
- Vertical profiles of pressure, temperature, humidity and wind (by GPS tracking).
- Vertical resolution : 50 meters.
  Max. altitude : ~15km (30km or beyond possible)
- RS launched every 12 hours at synoptic weather stations.
  Launches every 1 hour possible for a limited period of time.

Radio-soundings (2)



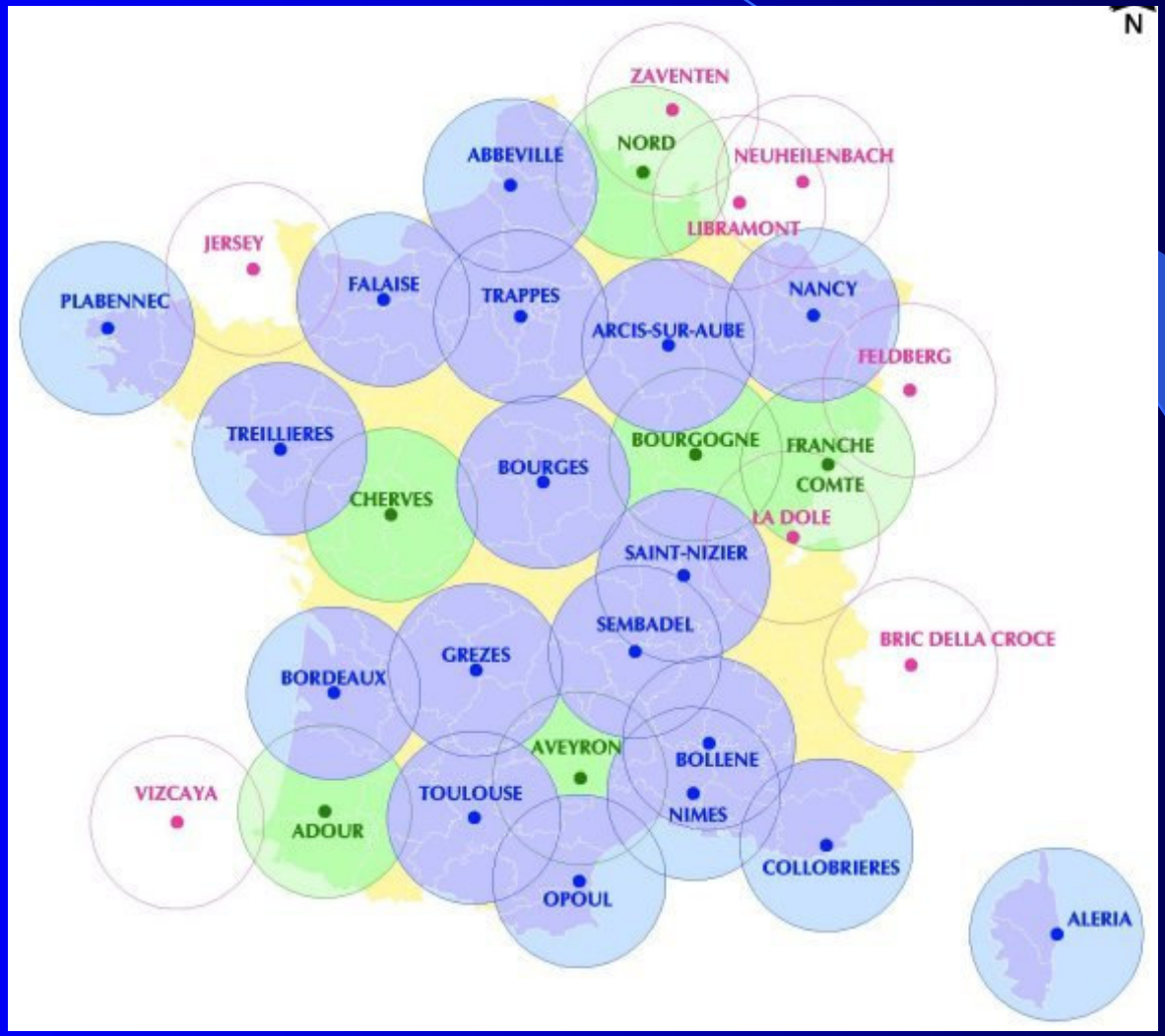
Radio-soundings (3)



Radars (1)

- Wavelengths between 5 and 10 cm
  - ↳ Detect hydrometeors (water droplets, ice crystals…)
- Max range: about 100km
- One image every 5 minutes.
- Horizontal resolution: 1km
- Polarimetric and Doppler functionalities available on some systems → classification of hydrometeors.

Radars (2)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TREILLIERES
BOURGOGNE
FRANCHE
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CHERVES
LA DOLE
SAINT-NIZIER
SEMBADEL
BRIC DELLA CROCE
GREZES
BORDEAUX
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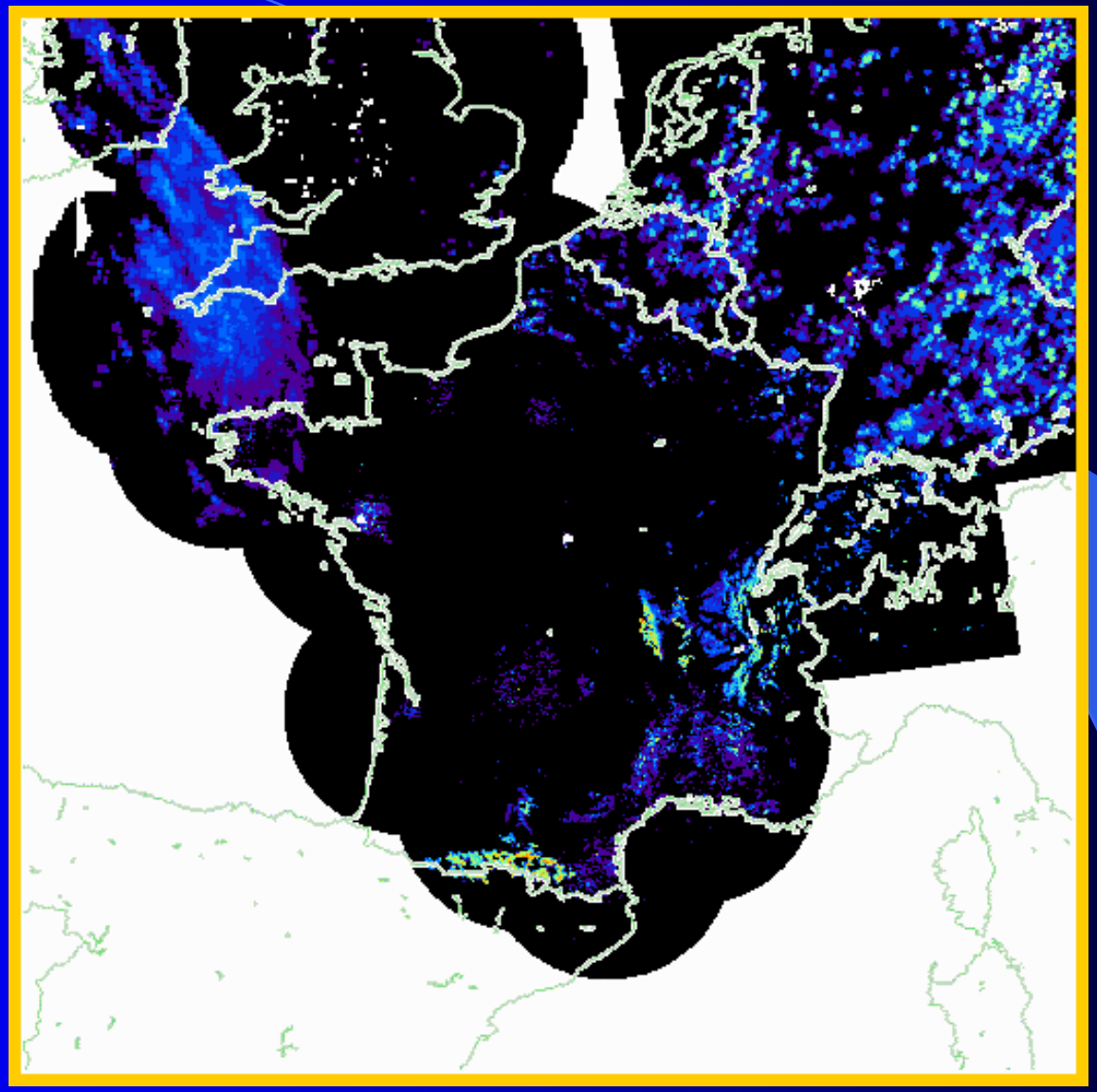
ADOUR
COLLOBRIERES
OPOUL
ALERIA

Radar (3)

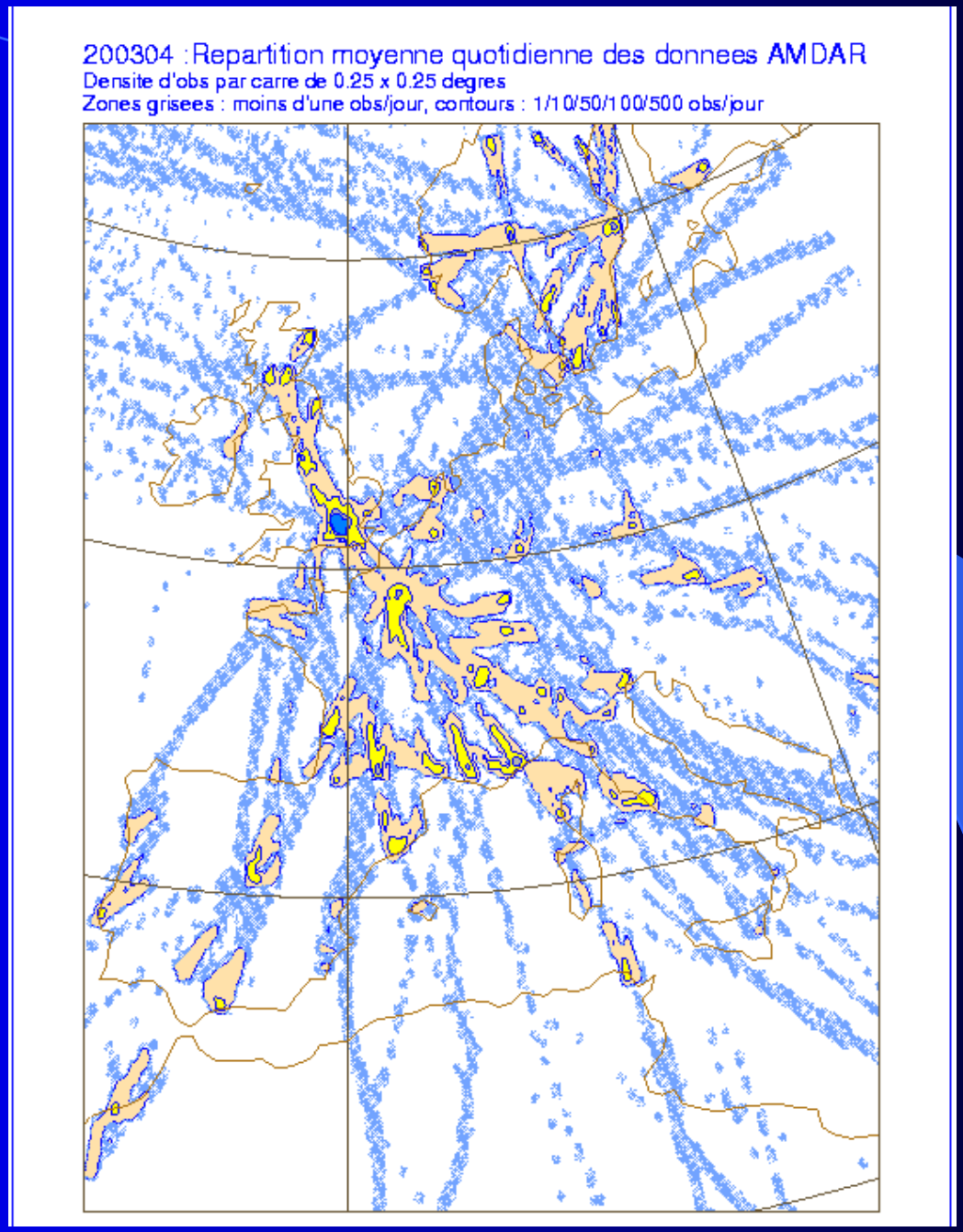


Radar image 15 May 2003

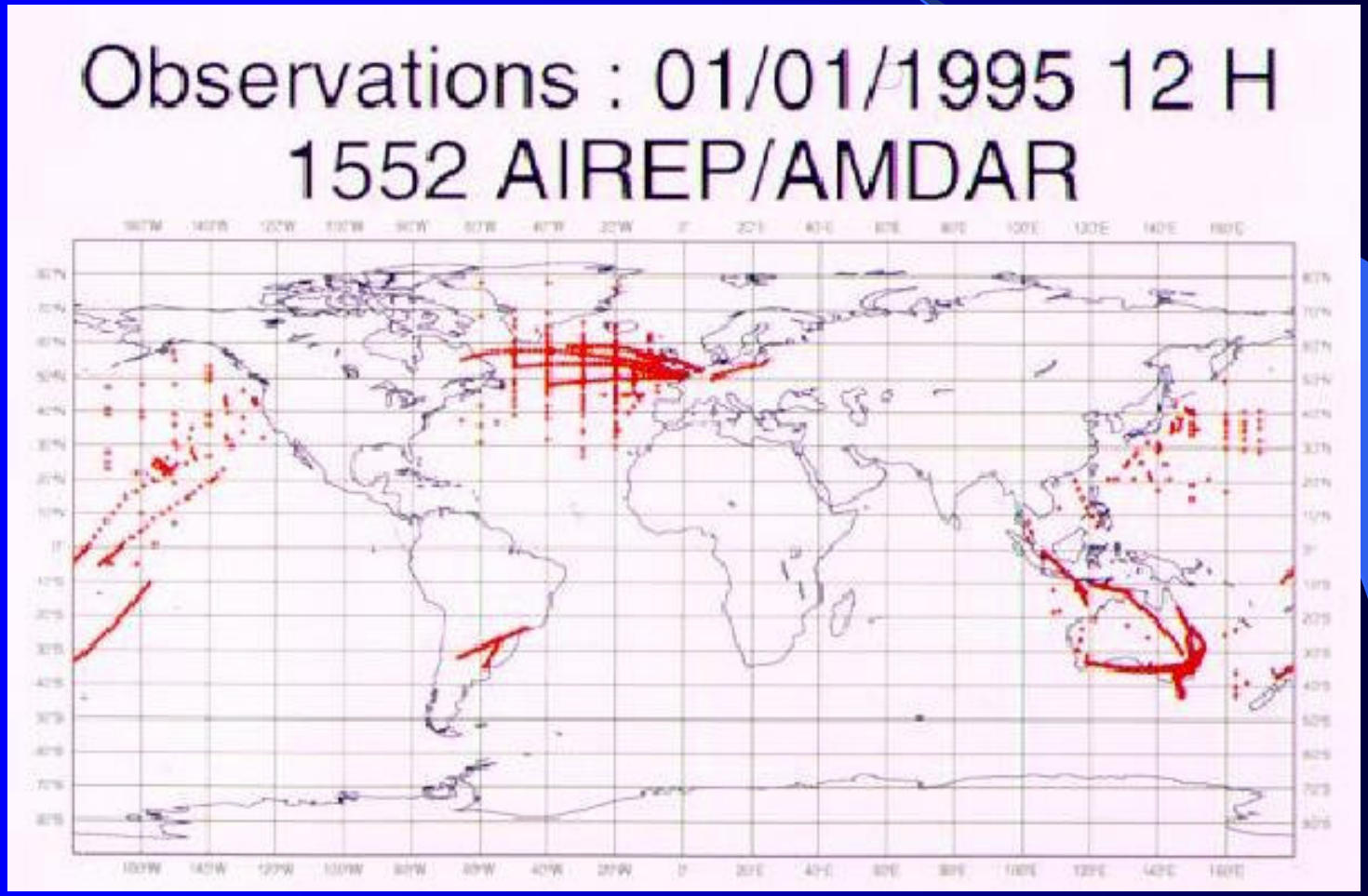
Airborne sensors

- Measurement of standard atmospheric parameters (PTU, wind, turbulence) from commercial aircraft specifically equipped.
- Measurement en route (AIREP) and during take-off and landing (ACARS, AMDAR).
- Irregular time and space coverage.
- Vertical profiles available close to major airports off synoptic times.

Airborne sensors (2)



Airborne sensors (3)



Availability of data to potential users

- Data from the operational network of Météo-France are not in the public domain.
- A special agreement exist for scientific users (low tariffs).
- To get data, contact the *Centre Départemental de la Météorologie* close to you, or the *Direction des Affaires Commerciales*.
- Mobile systems (RS, surface stations, radars…) can be deployed on demand (contact CNRM).