



Land-Atmosphere interactions : fog modelling

- Fog field experiments
- 1D approach + ISBA-DIF
- Intercomparison studies
- LES at metric scales



A long time ago : Carnin Fog Field experiments

(Guedalia et Bergot, 1992)



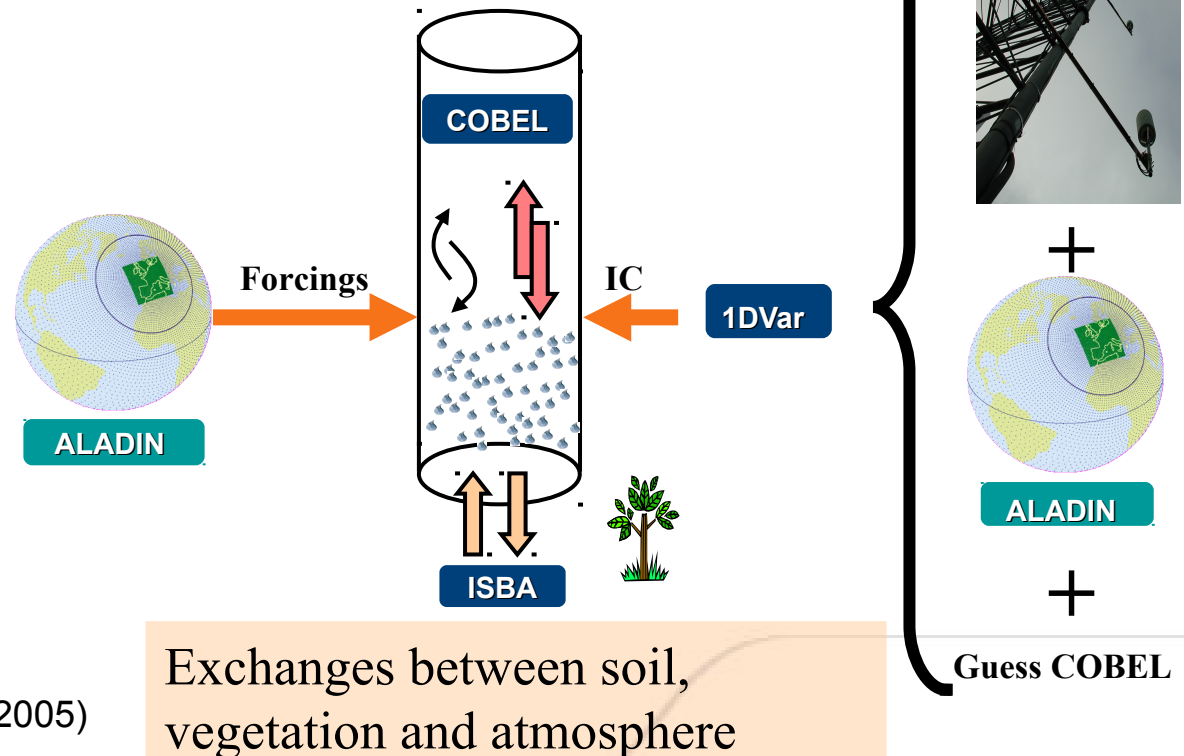
From 1988 to 1992:

- 80 meters tower (T/Hu/Wind/Visi)
- 3 * 5 meters towers : land-atmosphere interactions
- Soil properties + T / W

Joël helped us to define the science plan of this first fog field experiment in France, particularly concerning the documentation of the land-atmosphere exchanges

Description of COBEL-ISBA

- Main features of COBEL-ISBA (Météo-France, LA-UPS)
 - Coupling of an atmospheric model (COBEL) and a surface-atmosphere exchanges scheme (ISBA-DIF)
 - High vertical resolution (20 levels under 200m)
 - 1DVar assimilation scheme with site-specific observations
 - Detailed physical parameterizations for fog modelling (radiation)



References :

Bergot, Carrer, Noilhan, Bougeault (2005)

International Paris CdG airport : 2002

Ground measurements :

T / W inside the soil

short- and long-wave radiations



Airport terminal:

T / H%

Radiation fluxes

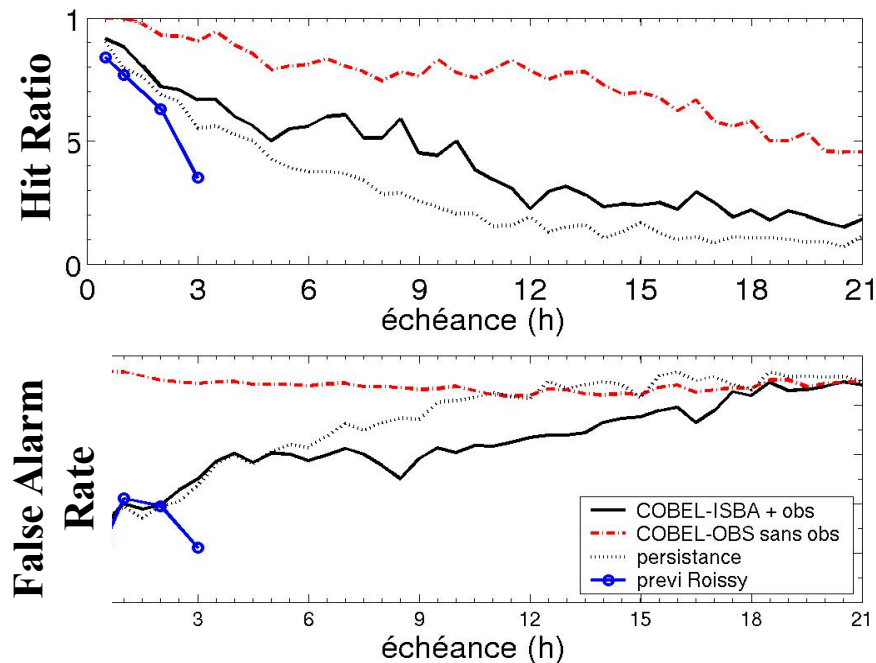


Meteorological tower of 30m :

T / Hu%



The human and scientific qualities of Joël helped us to drive this innovative project in very good conditions.



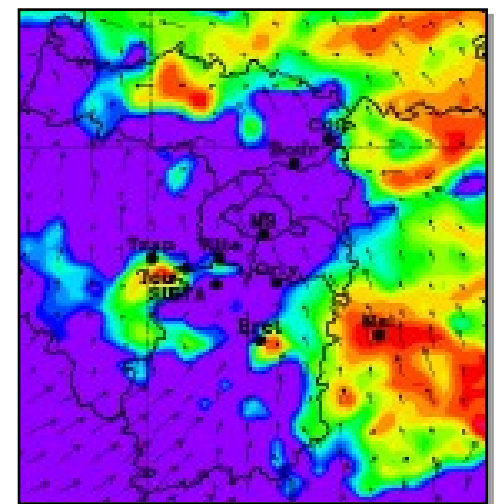
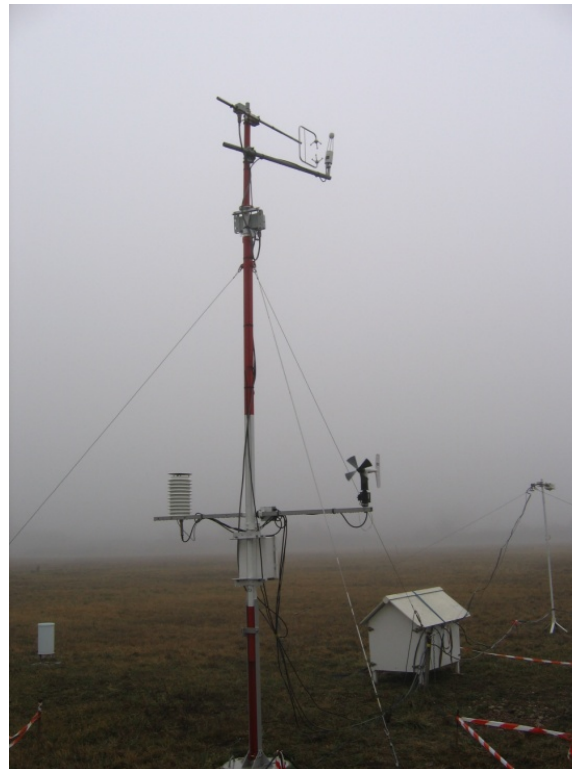
Intercomparison of numerical models for the fog prediction

Assess the capabilities and limitations of fog forecasting :
identify the models variability and weakness

European COST722 European action

Intercomparison based on observations made at CdG airport

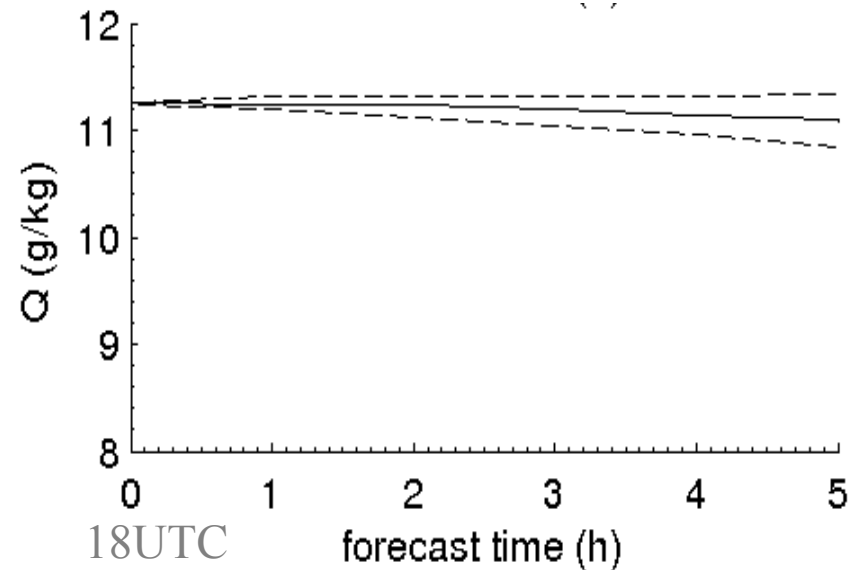
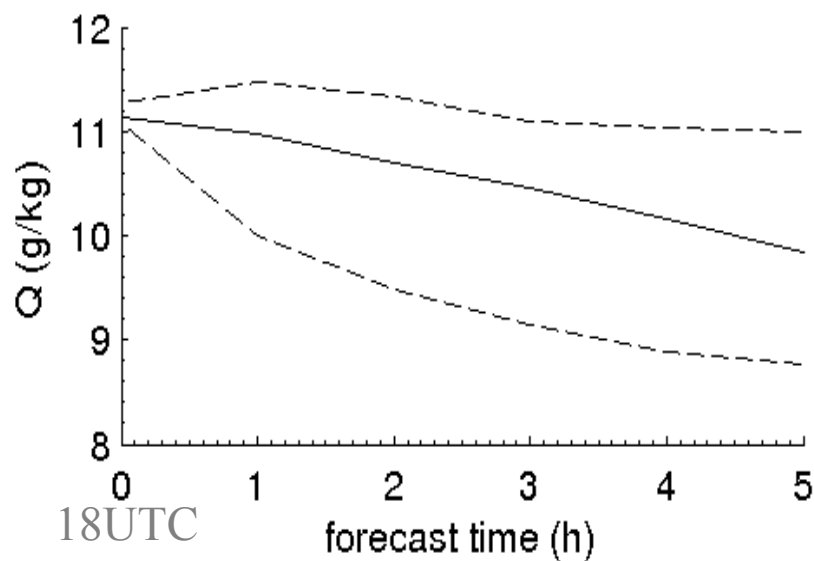
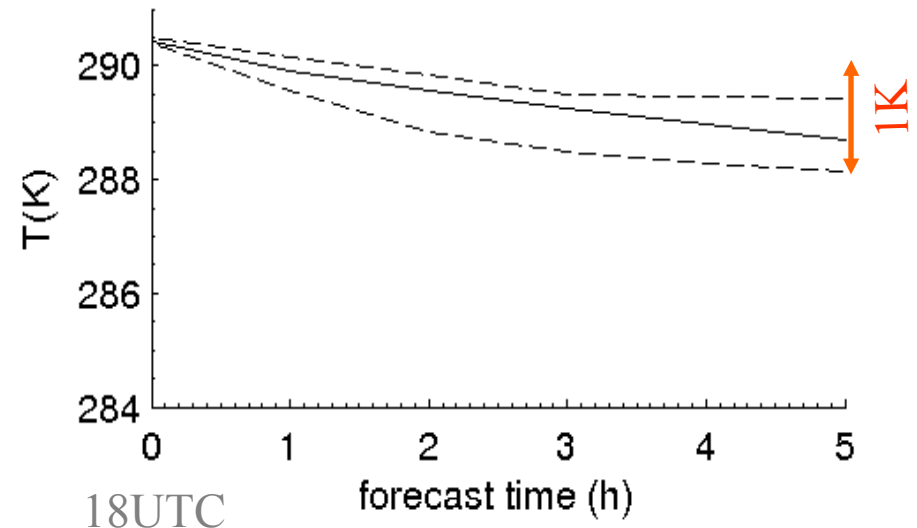
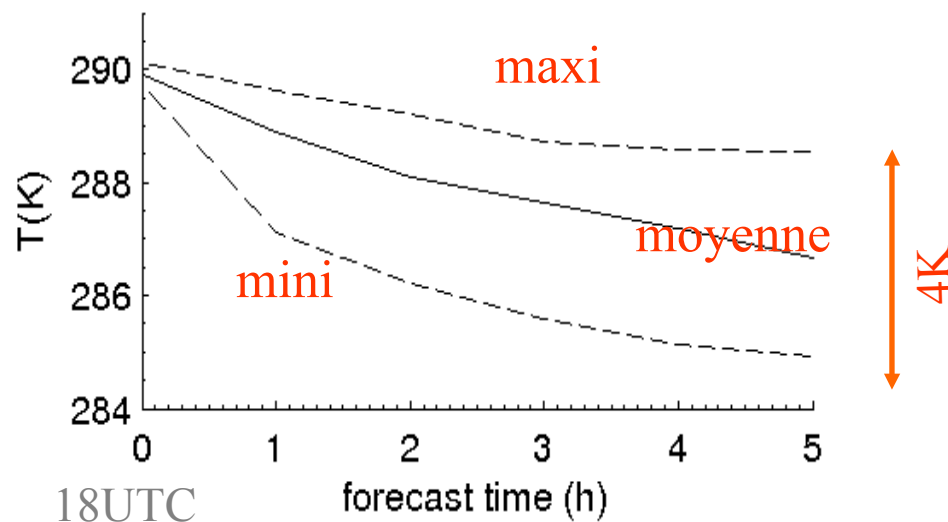
During coffee break discussions
(at this time, future works were
often discussed during daily
coffee break!), Joël convinced me
that a fog intercomparison
exercice could be very helpful to
make progress in fog forecasting



CdG intercomparison : study of the spread

2m

45m



- ✓ Maximum of spread at ground level (mean value close to observations)
- ✓ Weak spread at the top of the nocturnal boundary layer

Heterogeneities over airport : LES at metric scale over CdG



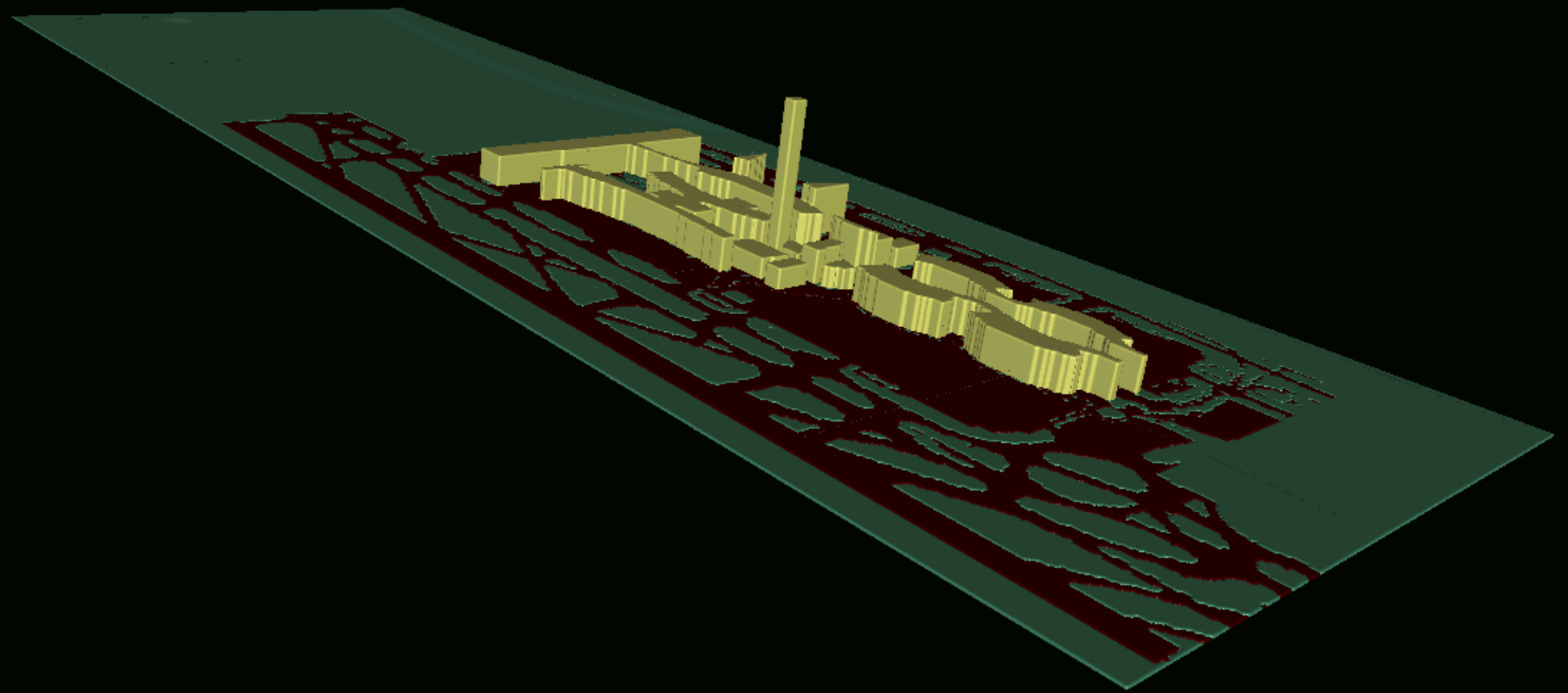
Study the effect of surface heterogeneities on fog formation :

- Fog took about 2h to form over the whole airport area

- The surface heterogeneities could explain the fog heterogeneities

- during the mature phase of fog, surface heterogeneities have little impact on fog





TimeStep: 0



Joel was also a talented wildlife photographer.

We had many discussions about the « gypaète barbu »

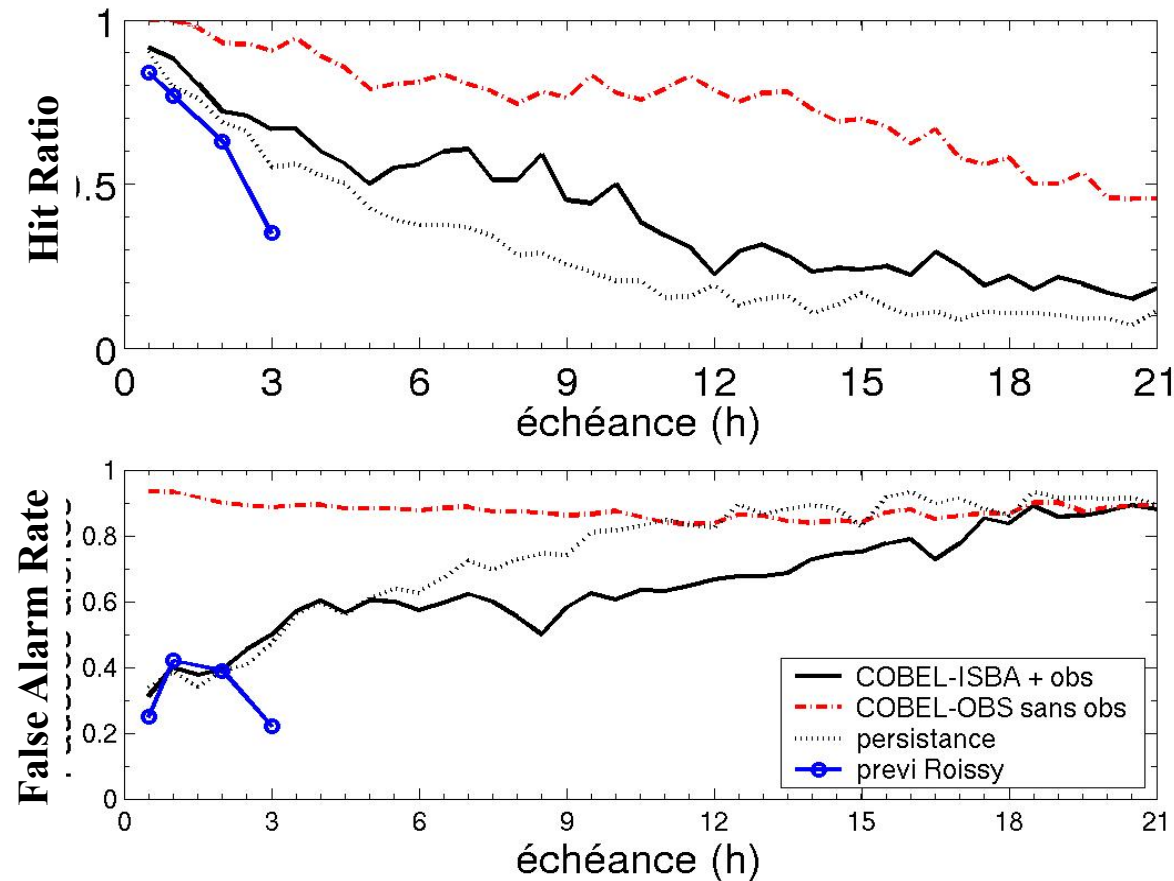


If you have questions about the « gyapète barbu » !

Fog forecasting: toward a local approach

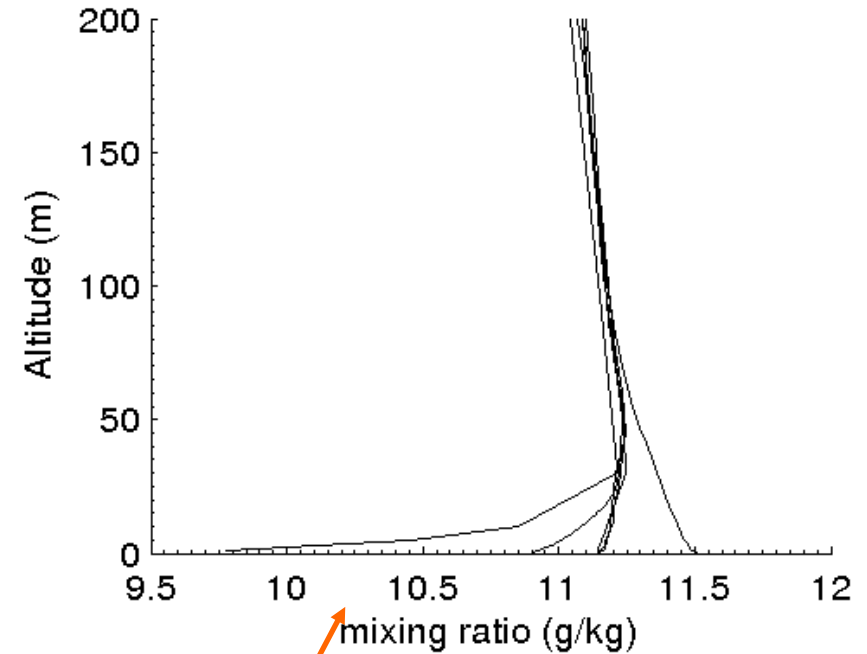
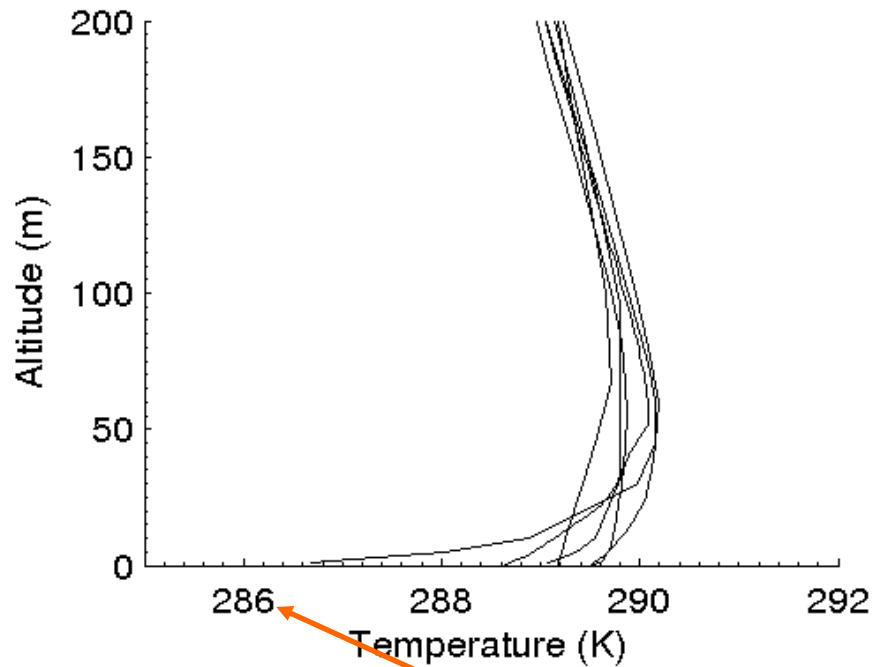
- Fog is a local phenomenon, which evolves at small time and spatial scales
- 3D fog modelling :
 - Vertical resolution too coarse
 - Physical parameterization often not accurate enough
- 1D fog modelling : Cobel
 - Allows better vertical resolution and more elaborate physical parameterizations
 - Possibility of easily using local data from a specific observation system
- Land-atmosphere interactions : ISBA
 - Accurate representation of land-atmosphere interactions
 - First use of ISBA-DIF + accurate dew deposition

OPER : influence of the observations (Paris-CdG)



- COBEL-ISBA is a useful tool for forecasters at Paris-CdG

CdG intercomparison : vertical profiles



Cooling and dew deposition

Surface exchanges drive the fog formation!

Huge spread between models (surface parameterizations)

→ it is necessary to better understand the surface – atmosphere interaction before fog!