

## Météo-France's views on EURRA

- the need for data-driven, 2D reanalyses
- the SIM proposal for soil hydrology
- the ANTILOPE proposal for precip analysis
- the ALADIN/AROME proposal for wind adaptation and a longer-term 3D-reassimilation
- Air quality aspects
- views on the EURRA organization

## The need for 2D reanalyses

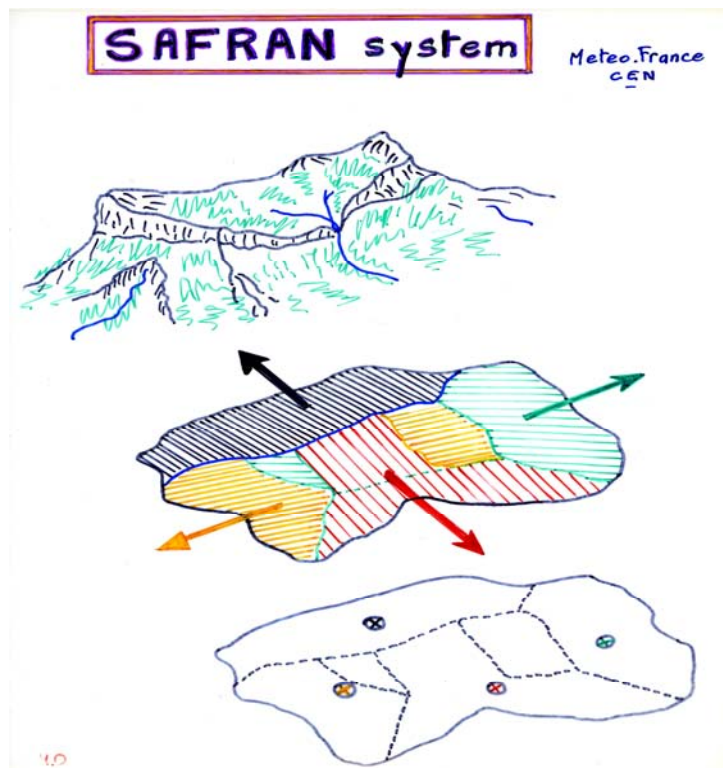
- a full-fledged 3D reassimilation is affordable at 10km resolution, but not yet at kilometeric resolutions
- it is unlikely to beat data-driven 2D analyses over Europe for most crucial products:
  - precipitation
  - cloudiness
  - surface state & hydrology
  - ...
- particularly true over data-rich regions
- 2D analysis tools need to be improved now for later coupling with 3D regional reassimilation systems

## The SIM (Safran+Isba+Modcou) proposal

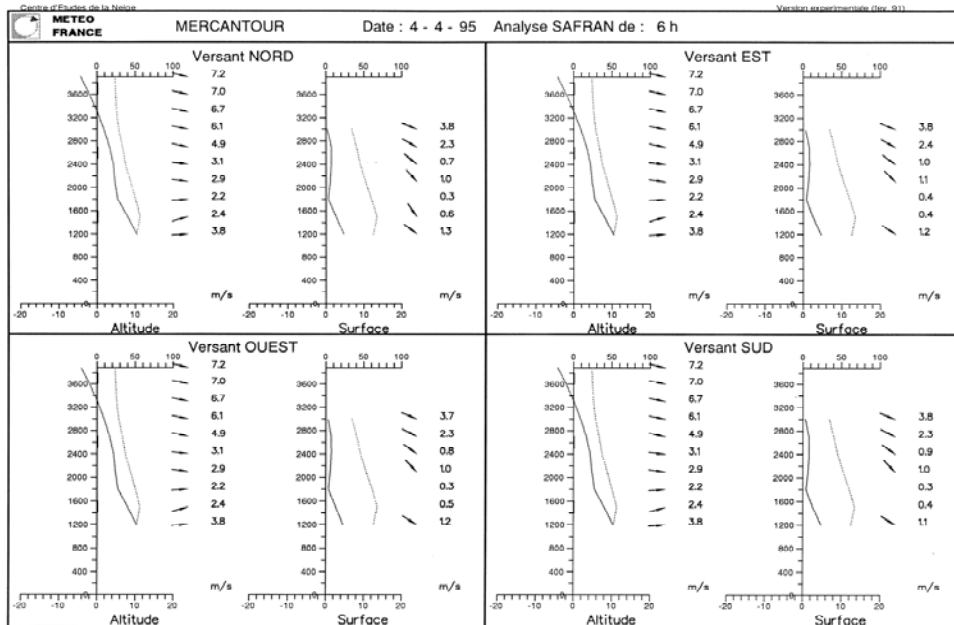
- **SIM produces analysis of low-level atmospheric parameters (T, hum, radiation, cloudiness, precip), soil state (T, hum, snow) and hydrological runoff information.**
- SAFRAN = **surface OI analysis & spatialization tool. Well proven for mountain environment: snow state, water content, avalanche risk.** Uses raingauge, satellite clouds, 1D-column physics for spatialization. Improvements possible for EURRA (interface to precip analysis, to 3D mesoscale models, use modern physics & assimilation algorithms)
- ISBA = 1D column **SVAT run in forced mode** (better than OI soil analysis so far). Other physics could be used.
- MODCOU = **hydrological model**, to estimate river discharge
- The integrated SIM system is **operational** over France: daily at ~10km resolution for agrometeorology and hydrology. Its performance has been **documented in the literature.**
- proposal: to extend SIM over Europe **with help from local hydrologists.** **Components from other centres (e.g. surface models) can be interfaced** and mixed to obtain estimates of analysis quality.

Accounts for  
subgrid altitude  
& slope  
exposure in  
analysis

(originally for  
avalanche risk,  
now for  
mountain  
environment &  
hydrology)



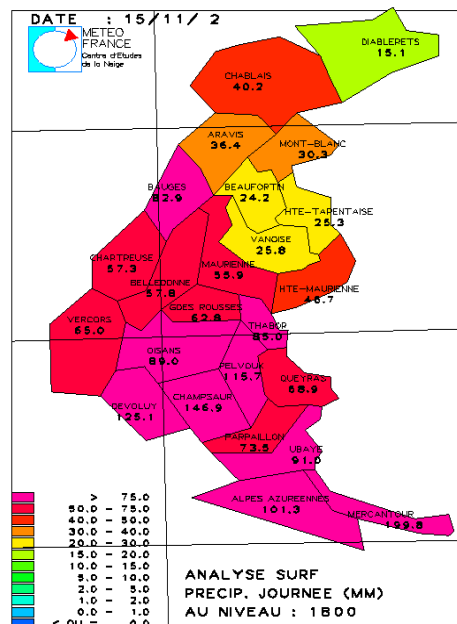
## Example of SAFRAN analysis on multiple Alpine altitudes & exposures



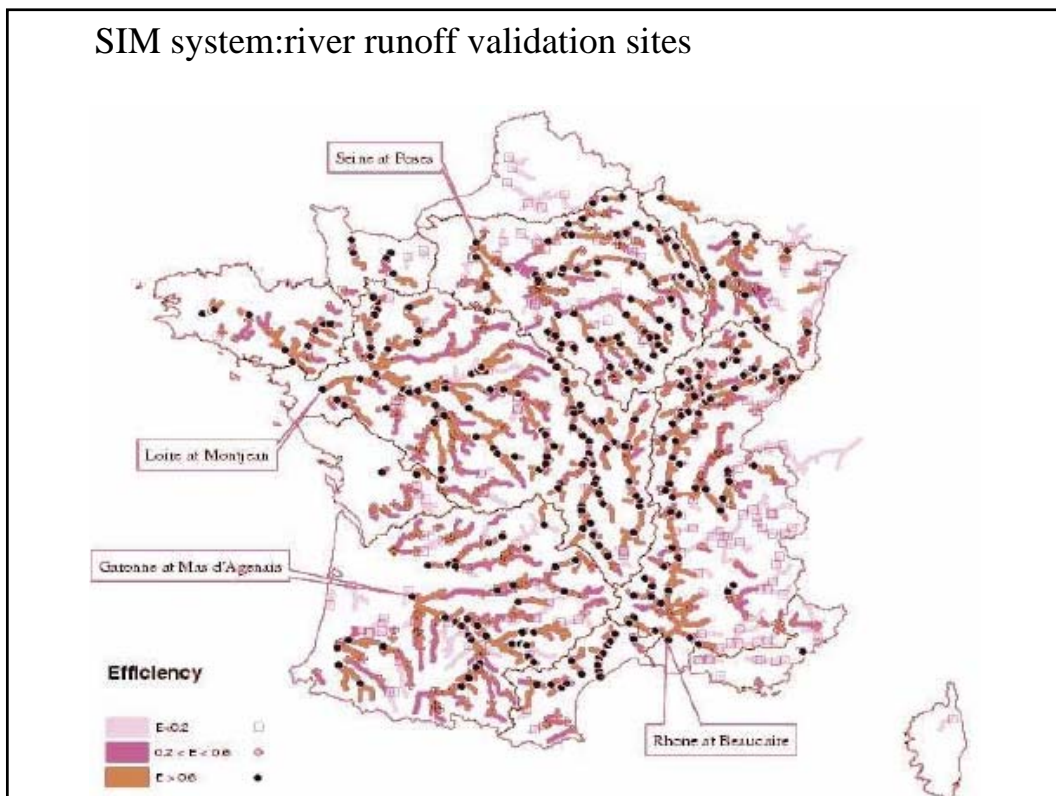
SAFRAN=  
desaggregation of  
observations from  
massif-scale to slope-  
scale:

24 massifs in Alps  
23 massifs in Pyrenees

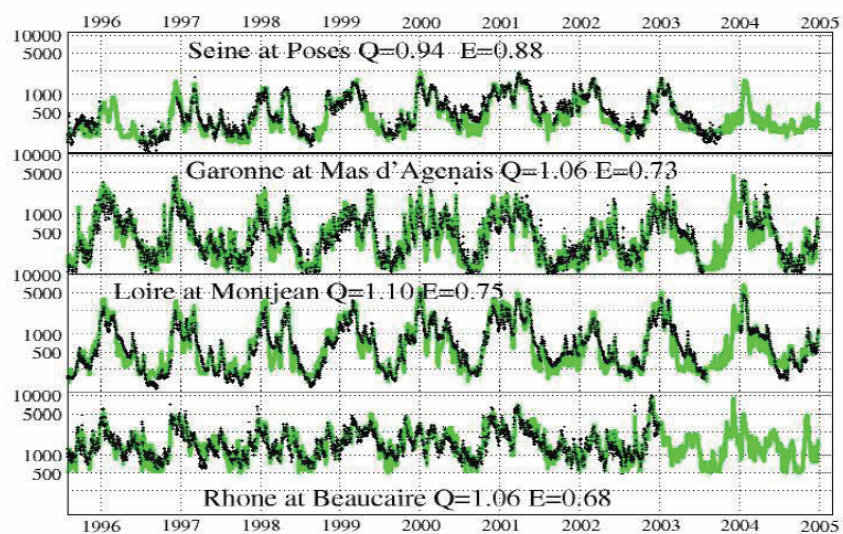
Discretization:  
-altitude at  $\Delta z=300\text{m}$   
resolution  
-7 exposures  
-3 slope steepnesses



## SIM system: river runoff validation sites



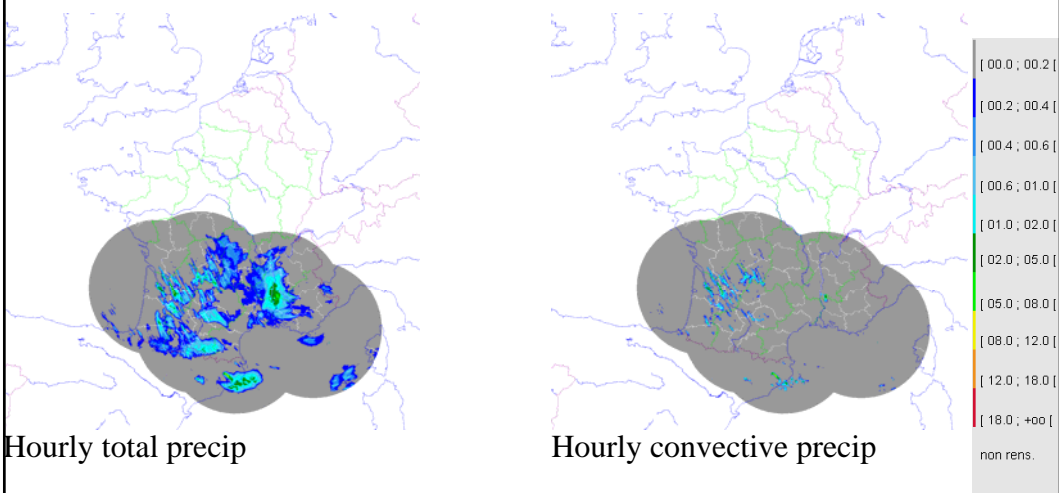
## SIM system: discharge simulation & obs on 4 major river exits



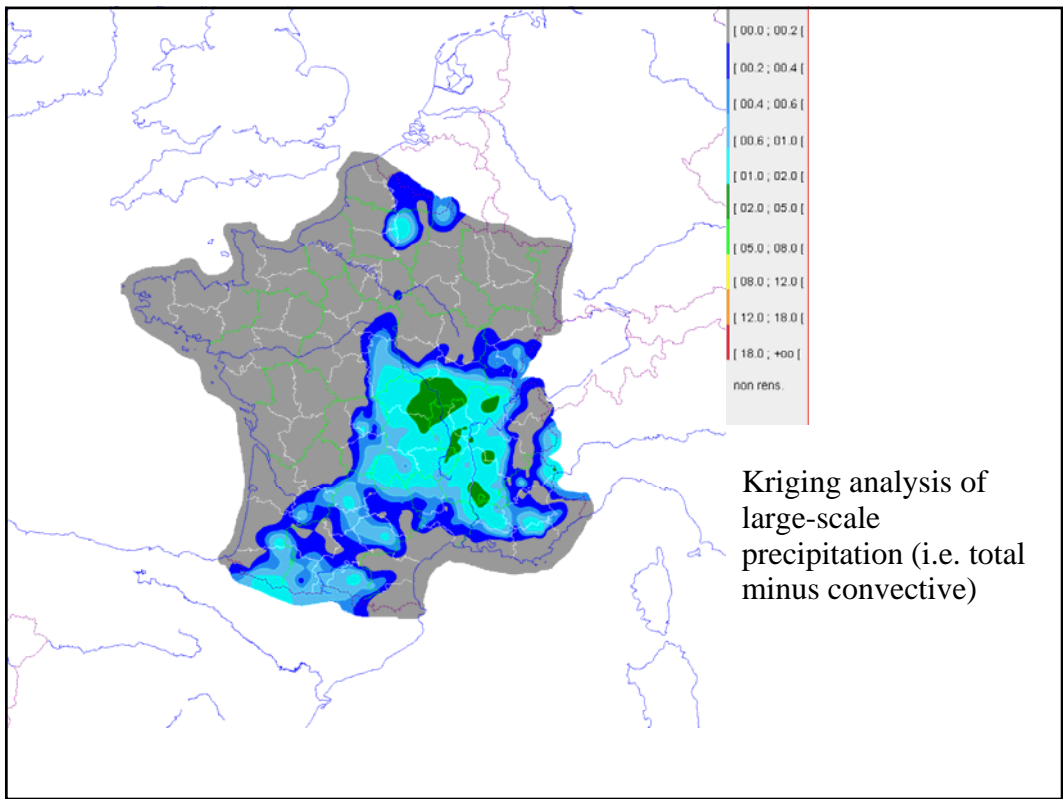
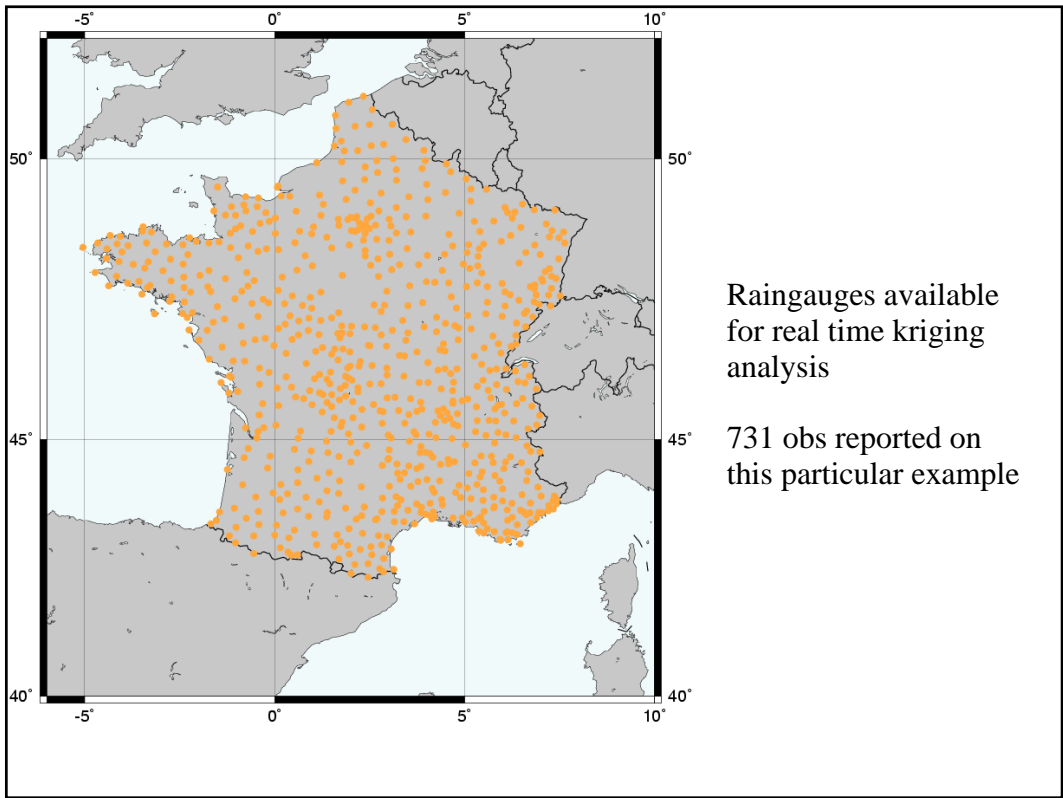
## The ANTILOPE proposal

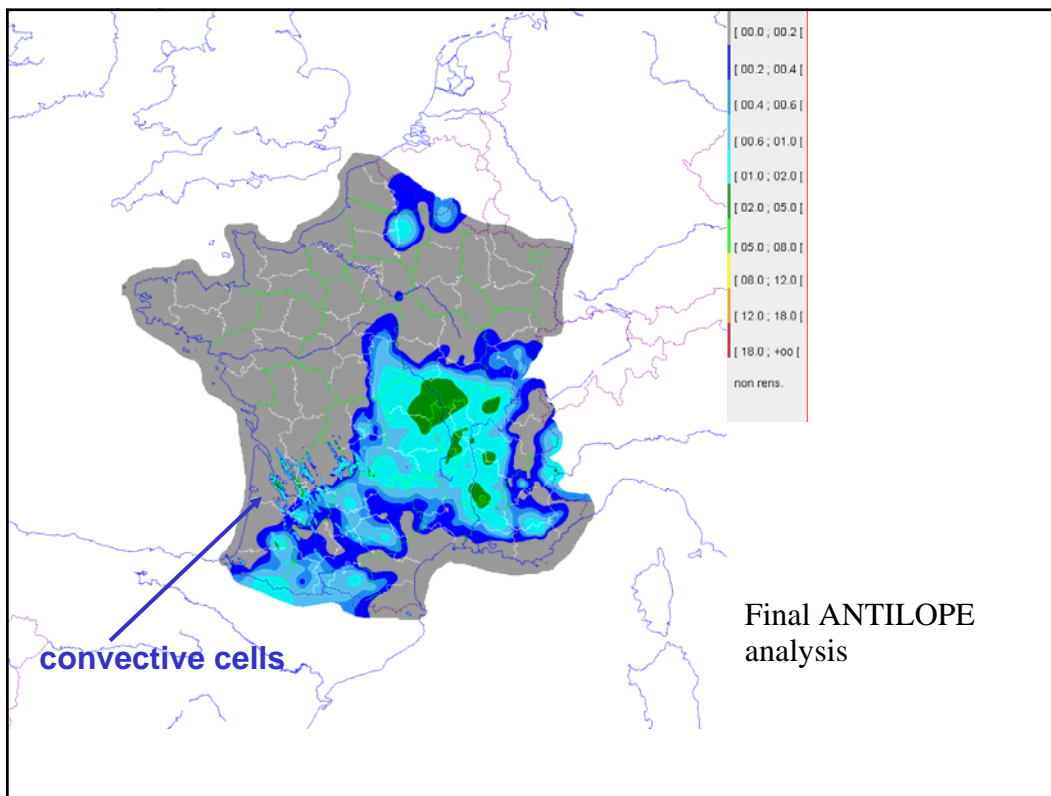
- **ANTILOPE produces precipitation analyses** in 1-hour increments, at up to radar resolution (1km<sup>2</sup>). Will be operational for nowcasting and hydrology in Météo-France in 2006.
- ANTILOPE blends
  - a 2D kriging analysis of **synop RR1h**
  - **radar composite 1-h accumulation** of precipitation (instantaneous radar rain rates can be used as fall-back option)
- The blending fits synop data in stratiform areas, but catches convective precipitation cells as seen by the radar (patented algorithm)
- Objective verification shows **ANTILOPE clearly outperforms raingauge interpolation, radar products and NWP model output**
- EURRA proposal:
  - adapt ANTILOPE to European-wide radar & raingauge archives
  - blend it with NWP products in data-poor areas
  - blend ANTILOPE with other techniques (e.g. SAFRAN) in mountain areas

## Hourly radar cumulated precip



→amount of convective precip time & convective contrib to total precip

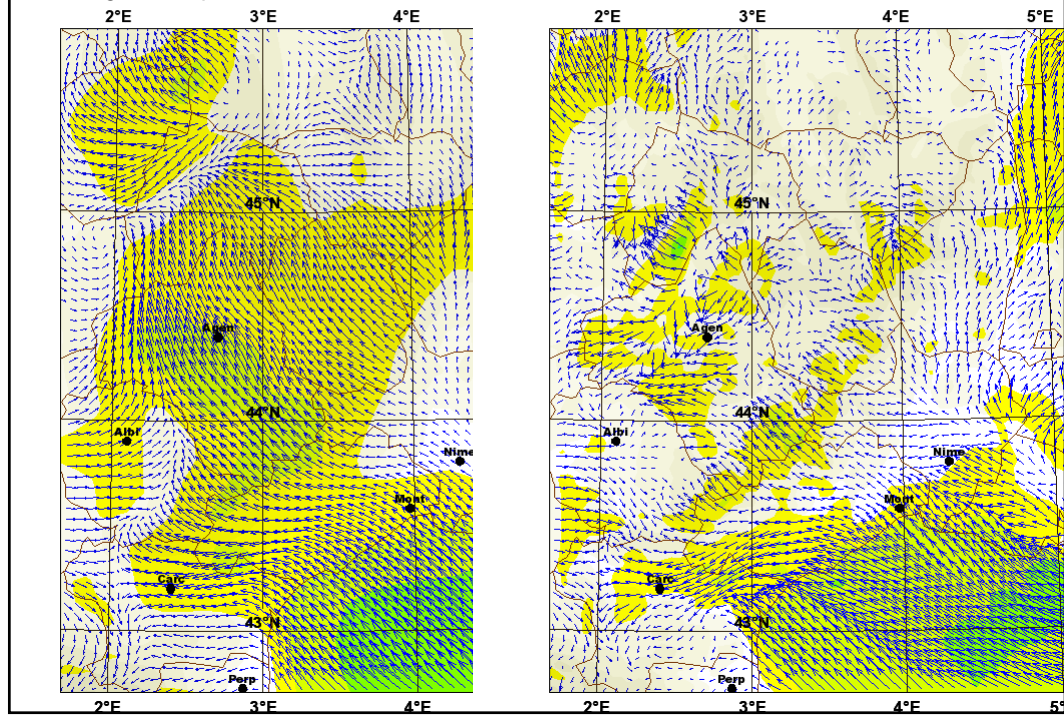




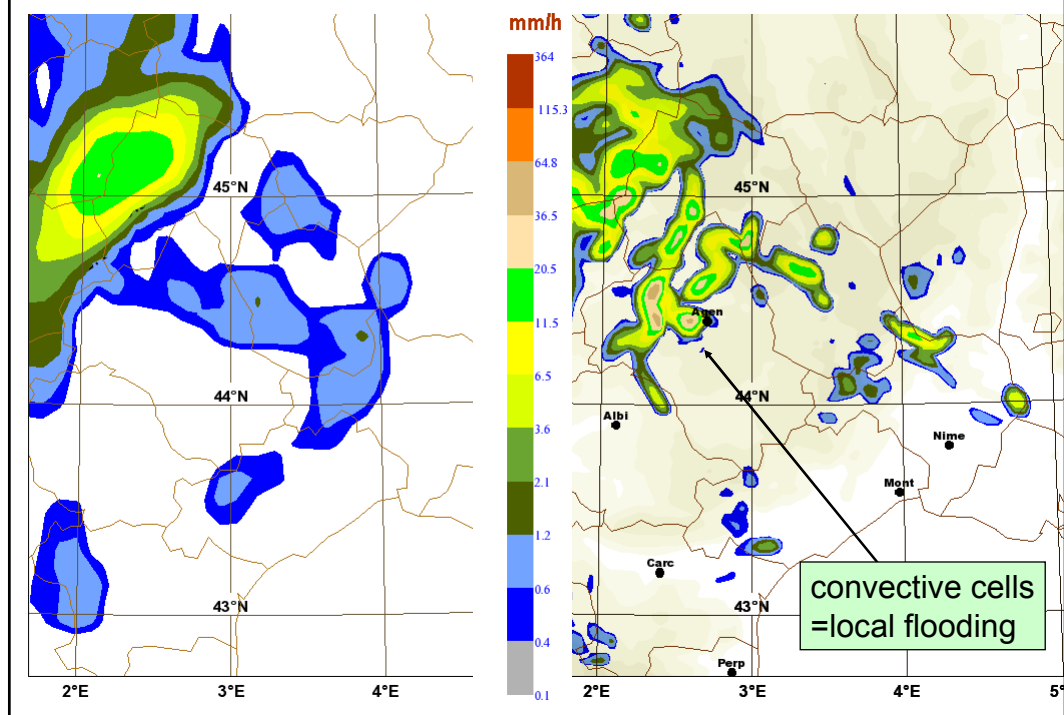
## The ALADIN/AROME proposal for 3D reanalysis

- ALADIN ready for ~10km NWP scale modelling, AROME for ~2km scales
- derived from IFS and **used in some form in most EU SMNs** (operational in ALADIN consortium, increasingly used in HIRLAM consortium)
- **cooperative development, contributions merged from various institutes**
- **ALADIN is ready for dynamic downscaling** of the ERA archive (already done by several SMNs, and used for regional climate runs in Météo-France). Could be done at 2km with Arome with suitable computing resources.
- **ALADIN 10km 3D-Var assimilation is operational in France and Hungary.** Could be interfaced with ECMWF ERA obs databases and tools (with ad hoc human resources), including satellites
- **AROME 2.5km 3D-Var assimilation** will be ready for experimentation in 2006, 4D-Var in ALADIN/AROME is expected in 2007
- **technical convergence with HIRLAM around 2008 = joint proposal likely by then**
- **Consistency with ECMWF tools, interest in *intercomparison & probabilistic postprocessing with other groups***

Wind forecast at resolution 10km (left) and 2.5km (right)  
 (shading=windspeed)

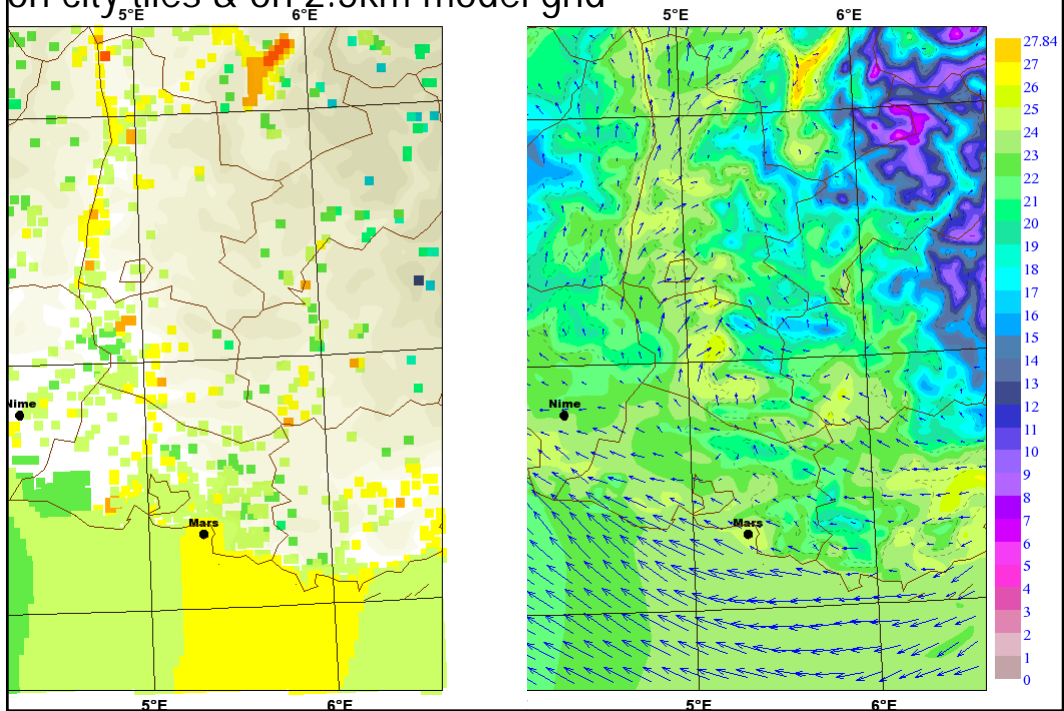


Precipitation forecast at 10km (left) and 2.5km (right) resolution



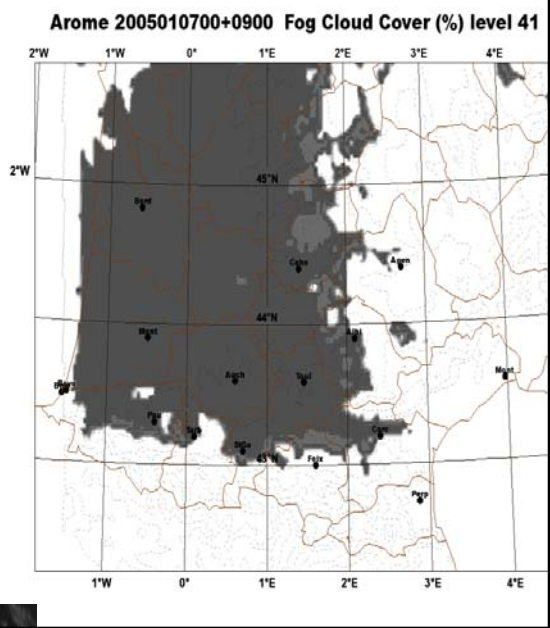
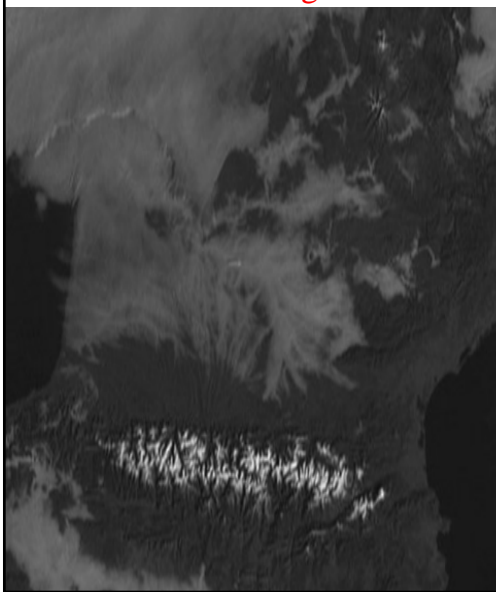


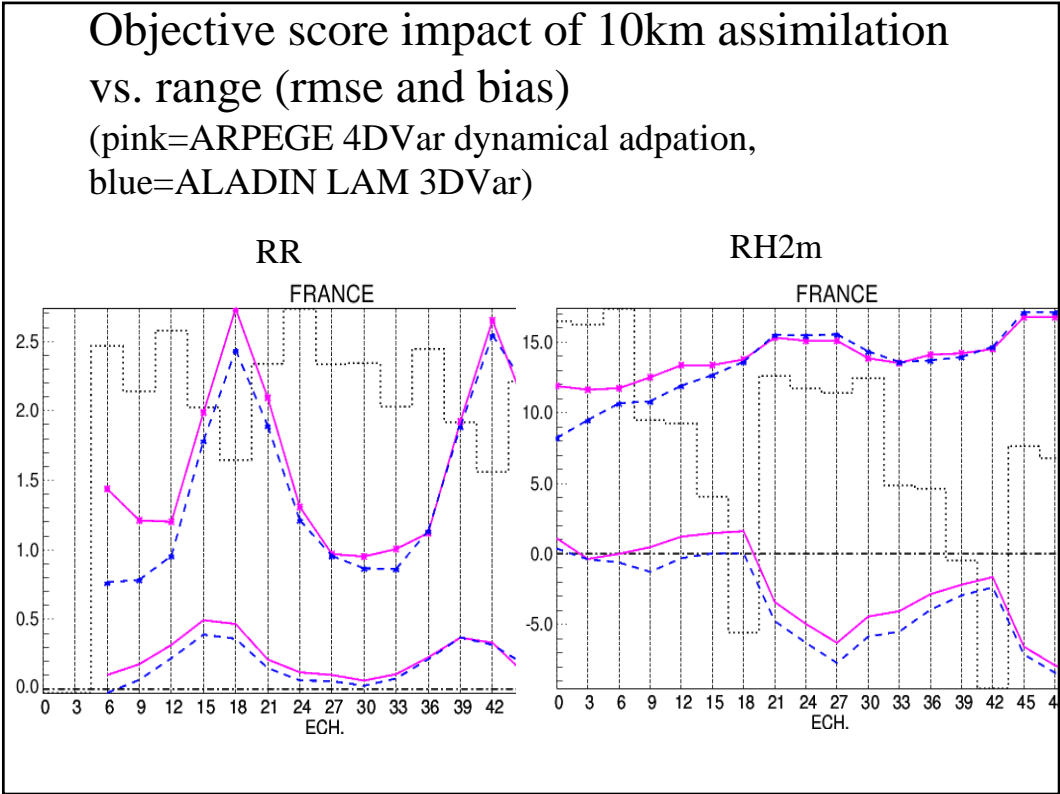
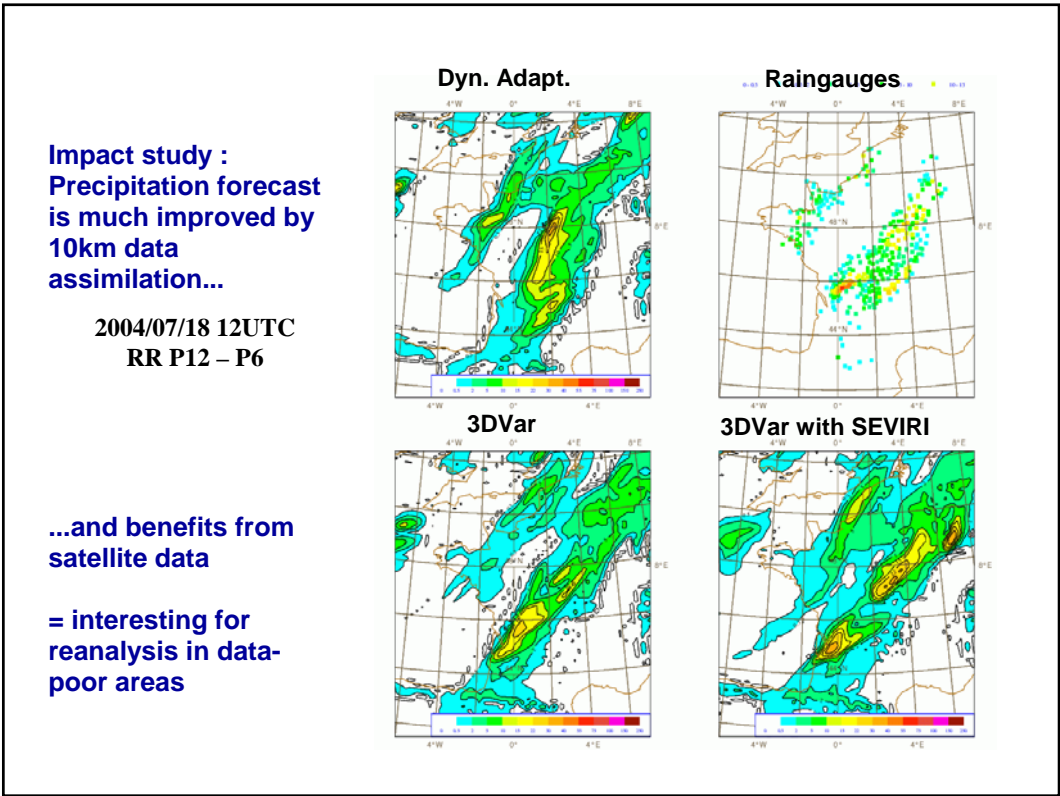
Arome surface temperature :  
on city tiles & on 2.5km model grid



*Arome-2.5km 9h-range fog dissipation forecast*

Meteosat visible image





## Air Quality aspects

- need access to
  - global reanalysis of reactive constituents (GEMS?)
  - historical emission maps
- does require high-resolution 3D atmospheric reanalysis (dynamic adaptation + cloud/precip analyses sufficient ?)
- Météo-France proposal: the MOCAGE operational air quality system (forecast model and data assimilation, operational over France since 2004)

## Conclusion: on the EURRA organization

- The European consortia have long experience in **mesoscale data assimilation, climatological databases and European-wide international cooperation.**
- **EURRA must involve most European SMNs** if their cooperation is to be expected (mandatory for data access and local expertise).
- ALADIN-HIRLAM consortia have an **established joint management structure.**
- EURRA is an opportunity for direct R&D cooperation with COSMO and GB groups on mesoscale NWP & climatology issues.
- EURRA will involve many subproblems that must be **adequately distributed**: 2D analyses, 3D models, databases, postprocessing, computing, archiving, data access policy
- The European NWP consortia are based on **successful coordination of local teams**, which are expert in local weather issues, and presumably **more scalable and cost-effective** than a centralized organization of EURRA.
- proposal: a multi-model EURRA managed by a coordination of the European NWP consortia