The ALADIN-France Limited-Area Model

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Description of the model configuration

The orography of the ALDIN-France is plotted in Figure 1. The domain extends from (57°N,20°W) to (33°N,18°E). The mesh-size is $\Delta x=\Delta y=9.5$ km on the conformal plane given by a Lambert tranformation. The spectral truncation is E159x159.

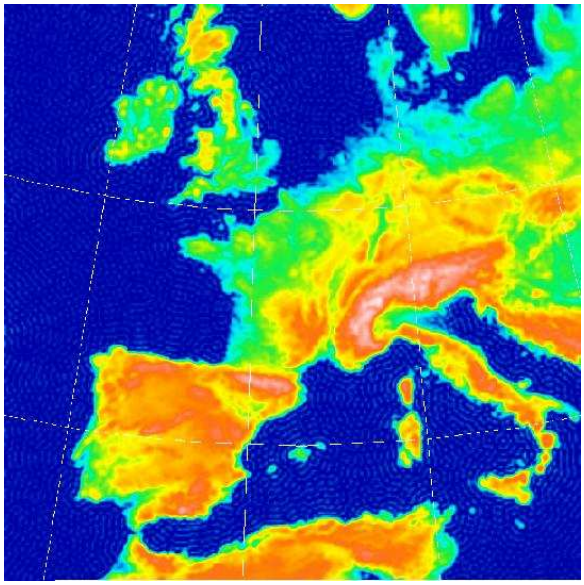


Figure 1: orography of the ALADIN-France model.

The vertical resolution is stretched along the vertical. The 41 levels are displayed in Figure 2 with a comparison with the vertical grid of the ECMWF model. The different features of the model are listed below :

•**New : 3DVAR assimilation, since 25 July 2005**
•Semi-implicit, semi-lagrangian dynamics
•Full physical package:
-ISBA soil scheme
-First order closure turbulence scheme
-FMR15 radiation scheme
-Bougeault mass-flux convection scheme
-Orographic GWD + envelope orography
-Adjustment to the saturation

The organisation in two cycles: one for the assimilation and the other for the forecast production is similar as the ones used for the operational model global ARPEGE. Both cycles

are plotted on Figure 3. Of course, the cycles of production for ARPEGE and ALADIN are coordinated because the ALADIN forecast used ARPEGE forecast at its lateral boundary conditions.

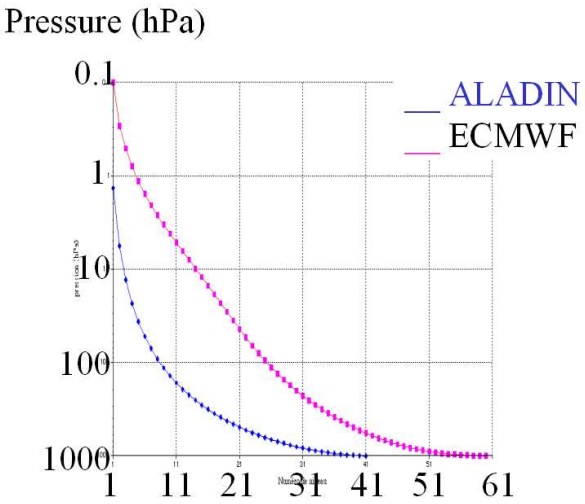


Figure 2: Pressure distribution of the vertical levels of the vertical grid of the ALADIN-FRANCE model

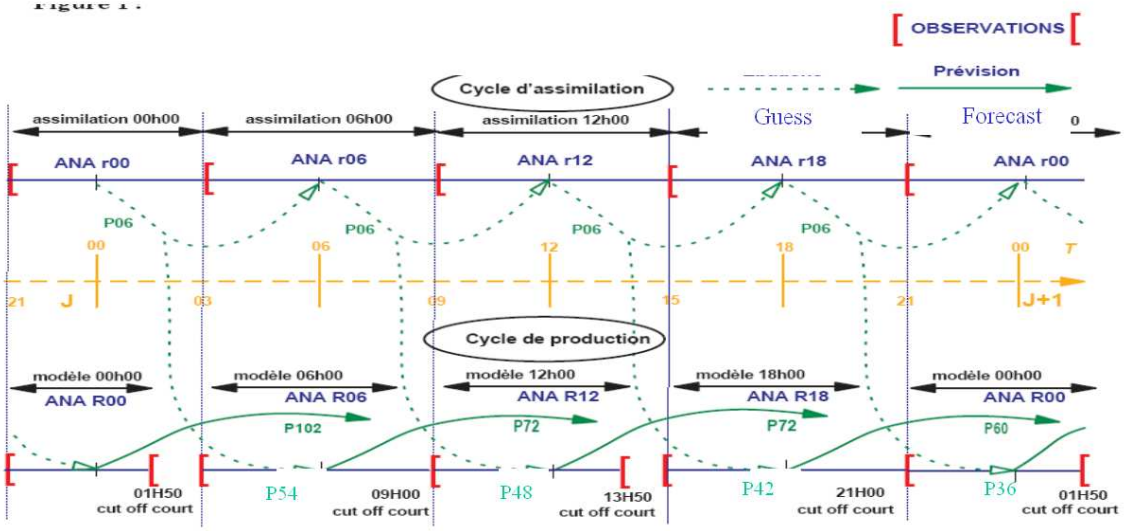
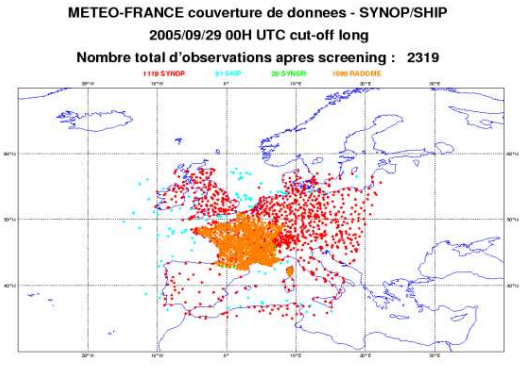


Figure 3 : description of the assimilation and production cycles for the new assimilation scheme 3DVAR for the LAM ALADIN-FRANCE. The cut-off are the same as for the ARPEGE model.

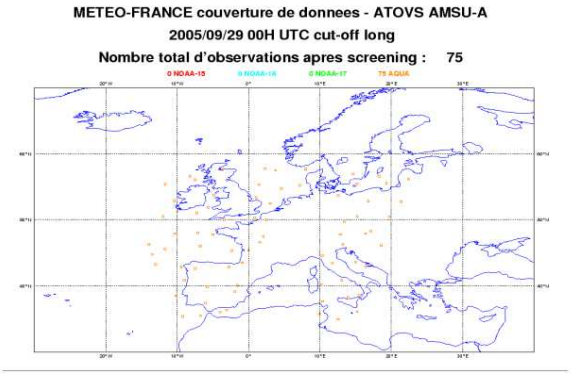
Both analyses use the same observations at the same resolution for the moment. The differences in the assimilation schemes are listed now:

- ALADIN uses a 3DVAR scheme and ARPEGE a 4DVAR one for their assimilations
- ALADIN assimilates temperature and humidity at 2m AGL for the altitude fields analysis and also SEVIRI radiances from Meteosat 8

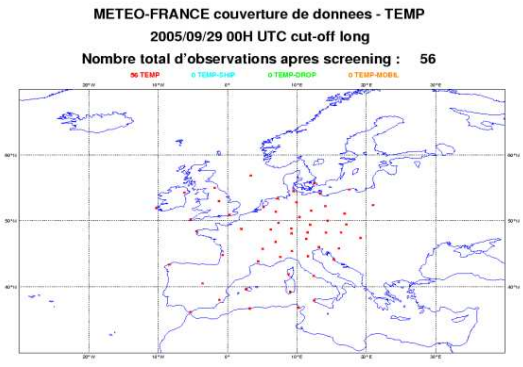
We report on Figure 4, the different distribution of data in the simulation domain of ALADIN.



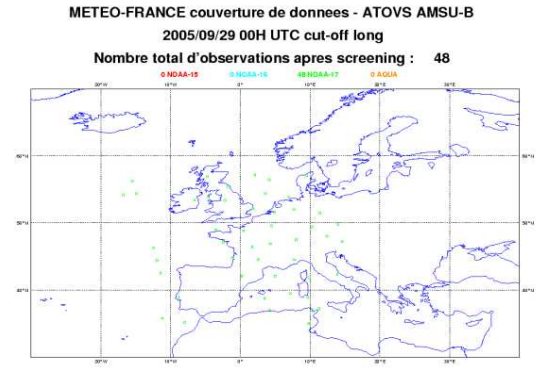
Surface data



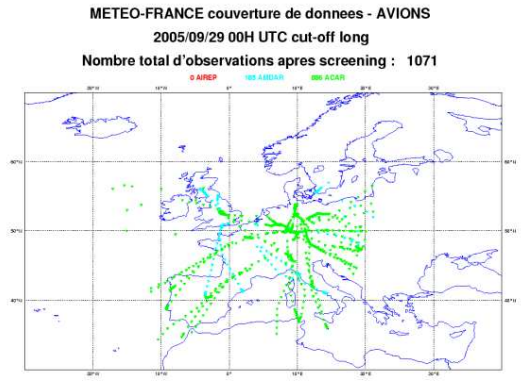
AMSU-A data



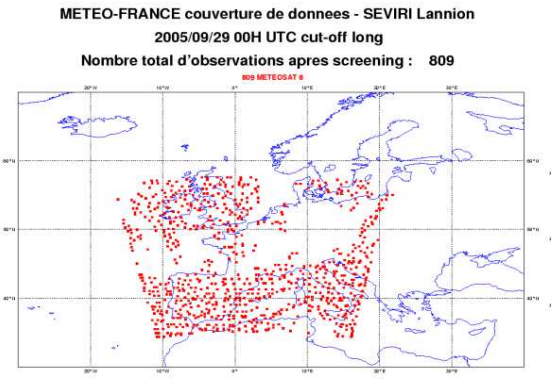
radio-sounding data



AMSU-B data



air-borned data



SEVIRI data

Figure 4 distribution of the data assimilated by the ALADIN 3DVAR scheme for the 29 September 2005.

We note the large amount of SEVIRI data in comparison with the other satellite data. This may help to improve the simulation of the southerly flows passing over the Mediterranean Sea before reaching Europe.

Presentation of the ALADIN performance for a heavy rain case

This case correspond to a very intense southerly case which leads to strong rain amounts in the vicinity of the Cevennes chain. It occurs from the 5 to the 8 September and different convective events happened to provide large amounts of rain, which lead to flood in the region of Nîmes at the end of the period.
The forecasts are presented for the 6 September and can be compared with the Nîmes radar and rain gauges observations (Figure 5).

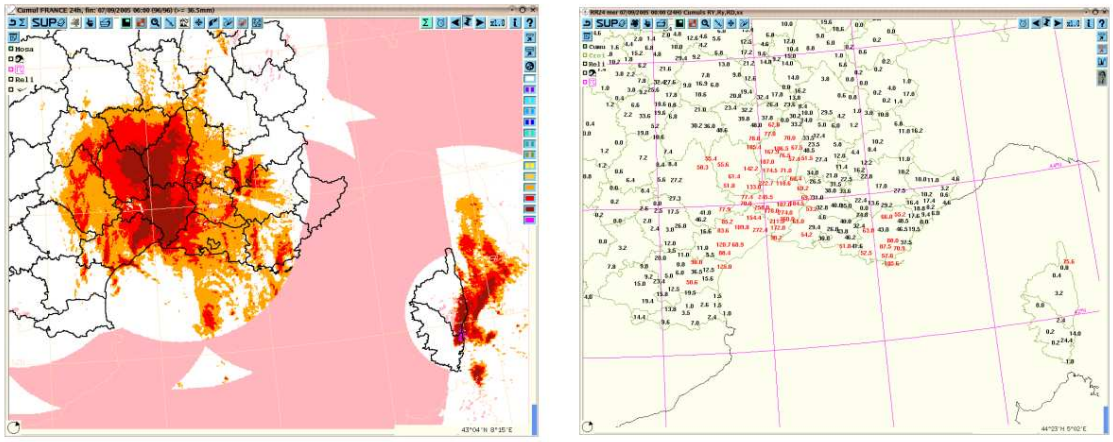


Figure 5: 24 hours accumulated rain measured by the Nîmes radar (left) and surface data for the same data.

The maximum of rain was observed between the Mediterranean Sea and the foothill of the Cevennes. Strong convective cells develop over sea and propagates inshore and provide intense rainfalls. This strong event stops during the night but amounts larger than 200 mm in the Nîmes region. The forecasts of the operational models were very informative about the amplitude of the event as can be checked on Figure 6, showing the forecasted accumulated rains for 2 global models ARPEGE and IFS (ECMWF model) and the LAM ALADIN. It can be noted that the models found a maximum in the Nîmes region but overestimate the rain over the Massif Central at the west of this city. All three models perform a non-detection over the Alps at the west of the Nîmes. Nevertheless, this good concordance between all these models and the quality of the forecast allow the centre of forecast to switch on a major alarm (red level) for this region to limit the consequences of these heavy rainfalls in terms of human and material damages.

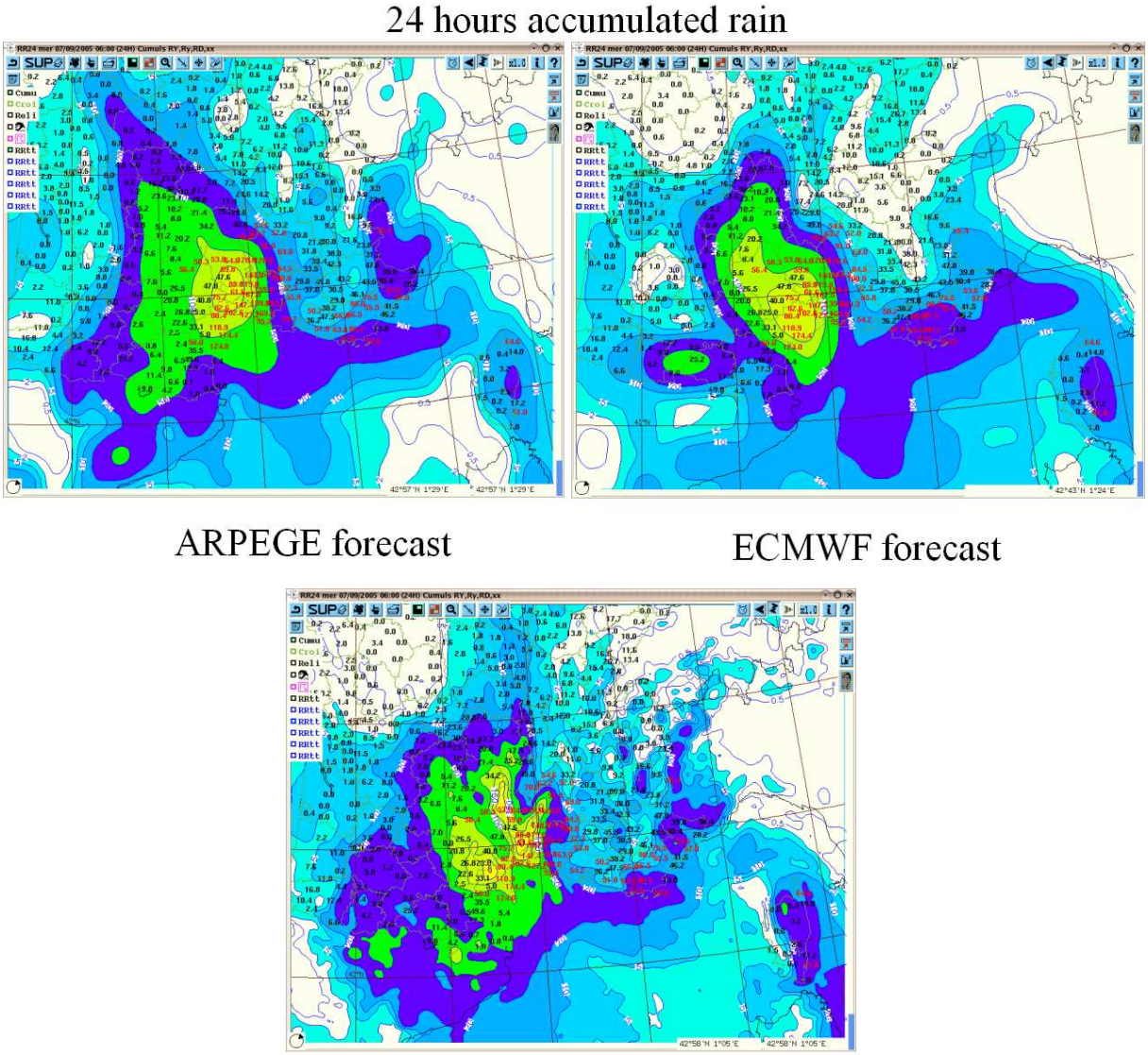


Figure 6 : Operational forecasts of 24 hours accumulated rain superimposed with the observations (Figure 5) from the 5 September at 6 UTC until the 6 September at 6 UTC. Green area correspond to rain exceeding 50 mm