THE REGIONAL NWP SYSTEMS AT METEO-FRANCE
with contributions from the CNRM/GMAP staff
Météo-France

ALADIN-FRANCE : some general features

About ALADIN-FRANCE

The French domain can be seen in Figure 1. The centre of the domain is located at 46.47°N; 2.58°E. Computations are performed in spectral bi-Fourier space with elliptic truncation at wave number 199. The equivalent grid has 7.5 Km gridmesh (400x400 points). The vertical dimension is discretized in 70 levels

During a forecast, ALADIN-FRANCE is coupled with ARPEGE every 3 hours. The timestep is 450 s to have an even number of iterations for 1h

4 runs are performed operationally each day at 00, 06, 12 ant 18 UTC. Forecast terms are 54H for the 00 UTC forecast, 48H for 06 UTC, 42H for 12 UTC and 36H for 18 UTC.

The operational Data assimilation

The assimilation scheme is 3D-Var with a 6H window. A continuous "long cut-off" cycle provides the guess for a "short cut-off" production which provides the operationally used analysis. Coefficients for variational bias correction (applied to satellite observations) are computed by Arpege.

Fig.1. The ALADIN-France operational domain.

Assimilated observations are :

− Surface pressure and SHIP winds
− T2m and RH2m, 10m winds
−Aircraft data
−Drifting buoys surface pressure
−Soundings (TEMP, PILOT)
−European wind profilers
−Winds from AMV (SATOB) and scaterometers
−GPS (ZTD and radio occultation)

−Satellite radiances: AMSU-A, AMSU-B, HIRS (NOAA and METOP), Meteosat-9 SEVIRI (5 channels), clear-sky microwaves over land, cloudy AIRS, IASI (sea/land/sea-ice), AQUA/AIRS channels (~54)
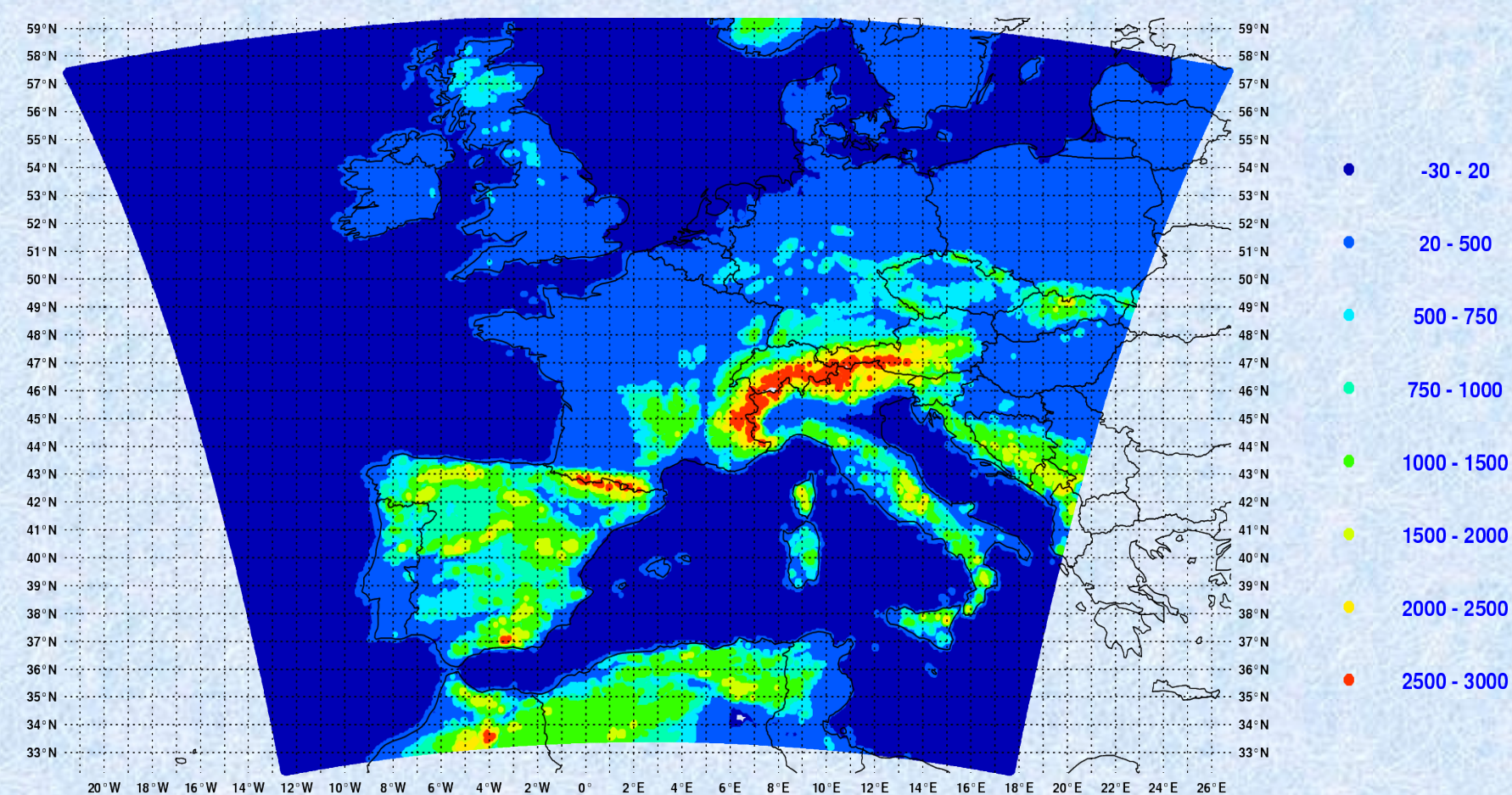
Changes in the operational suite ARPEGE-ALADIN

The cycle for the operational suite is CY36T1_op2. It has been running since September 2011.

.

- Assimilation of SSMI-S F18, TERRASAR-X, C/NOFS and ATOVS/RARS (Regional ATOVS Retransmission Service) observations.

- New RTTOV coefficients for AIRS and IASI

- Tunings of the simplified scheme for large scale clouds and microphysics in 4D-Var.

- Deep convection scheme : i) local consumption of moisture convergence when exceeding a threshold on resolved vertical velocity, ii) modulation of convective entrainment with resolved vertical velocity.

- Microphysics : introduction of rain freezing.

- Introduction of SURFEX in ALADIN configurations with assimilation (France, Réunion, French Antilles and Guiana, New Caledonia, Polynesia). Same SURFEX options used as in AROME (ECOCLIMAP, ISBA-3L, etc) except TEB scheme for the time being.
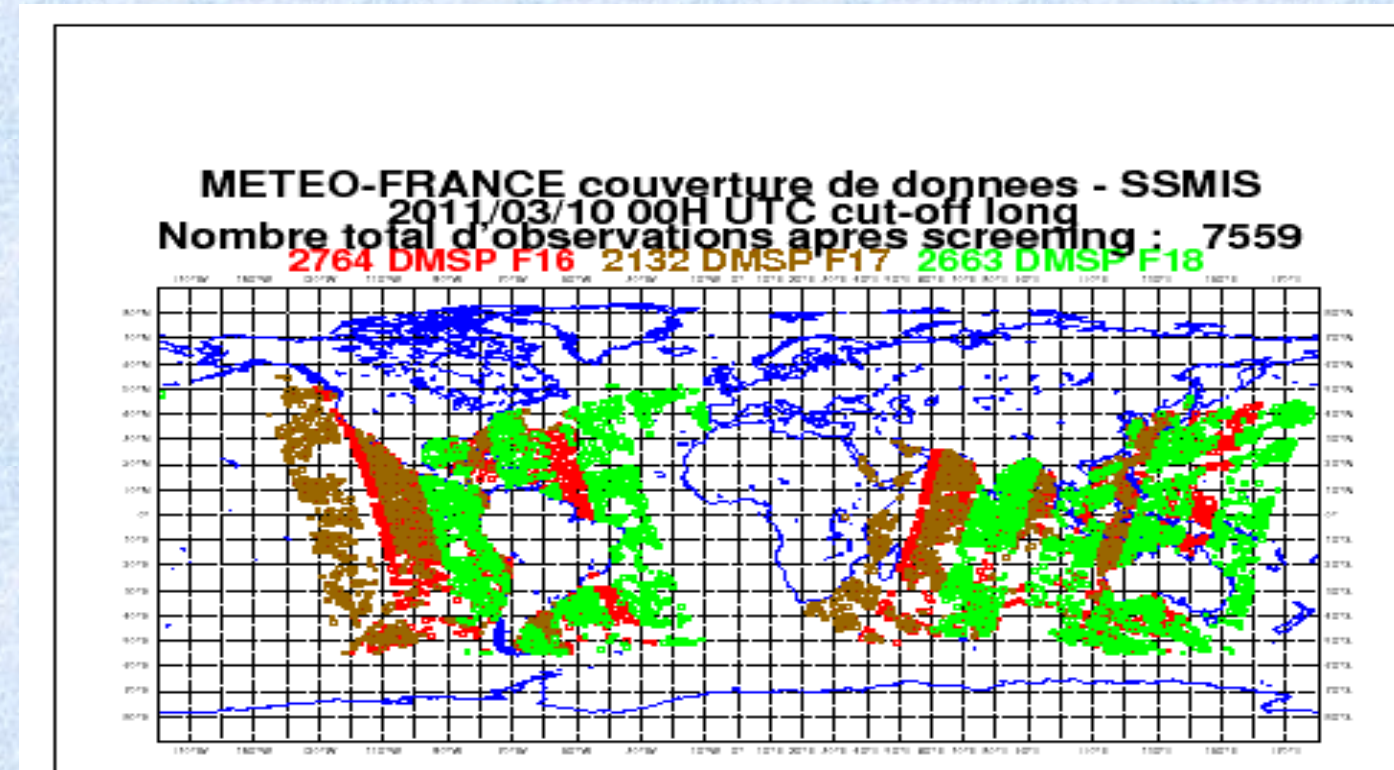

Fig. 3. SSMI-S observations (F16/F17/F18) assimilated in the 4D-Var analysis in the E-suite (10/03/2011 at 00 UTC).
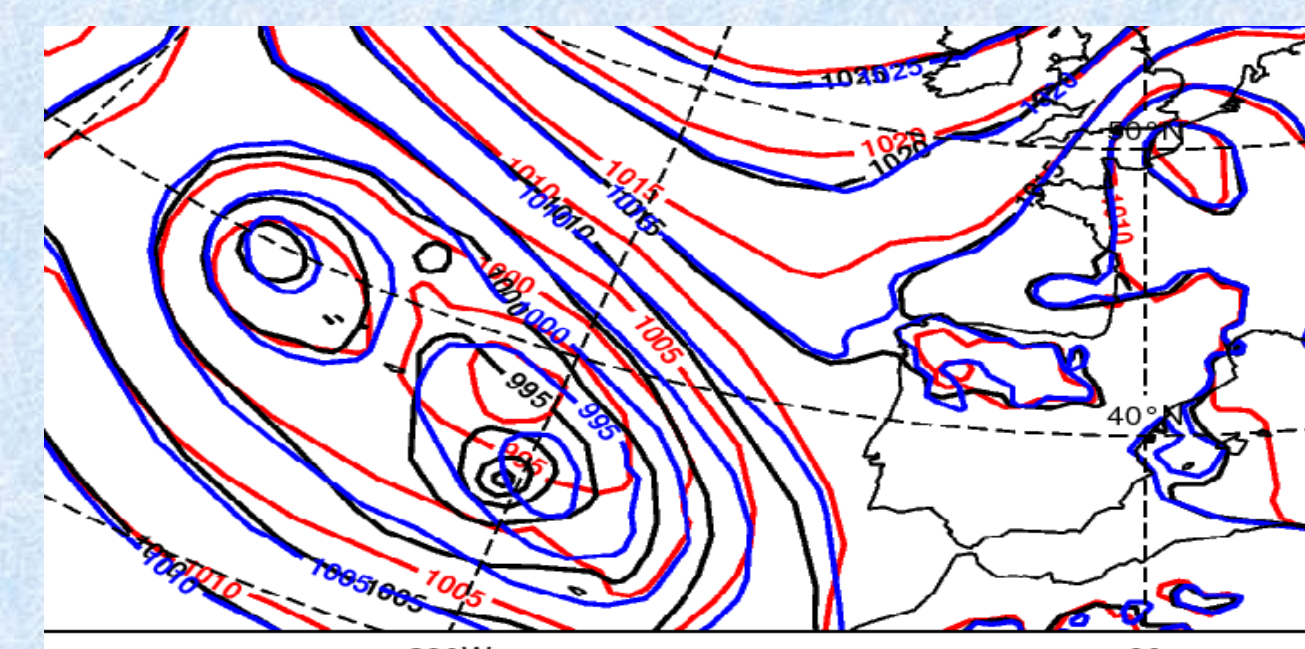

Fig. 4.Mean sea level pressure valid 18/12/2009 at 00 UTC. Analysis (in red) and 24h forecasts of the operational (in black) and e-suite (in blue) models, both starting from same initial conditions.

Next e-suite ARPEGE-ALADIN

The cycle for the e-suite is CY37T1_op1. It is planned to start by end of 2011.

.

Changes in the Arpege Ensemble Prediction system

PEARP3 (operational version since September 2011) :

Running at 06 UTC with a 72h range - 18UTC with a 108h range
A control run and 34 operational members
Initial perturbations :

−   dry singular vectors on 7 different areas >
−   using the 6 analyses and the mean computed by AEARP (Assimilation Ensemble ARPege)
−   scaled to an amplitude size using error variances background of the day consistent with 4D-Var assimilation cycle

	OTI	Res.	Norm
EURAT	18	T195	TE
HNC and HS	24	T195	TE
TROP	18	T195	KE

Model perturbations : multi-physics (9 physics +ARPEGE operational physical package)
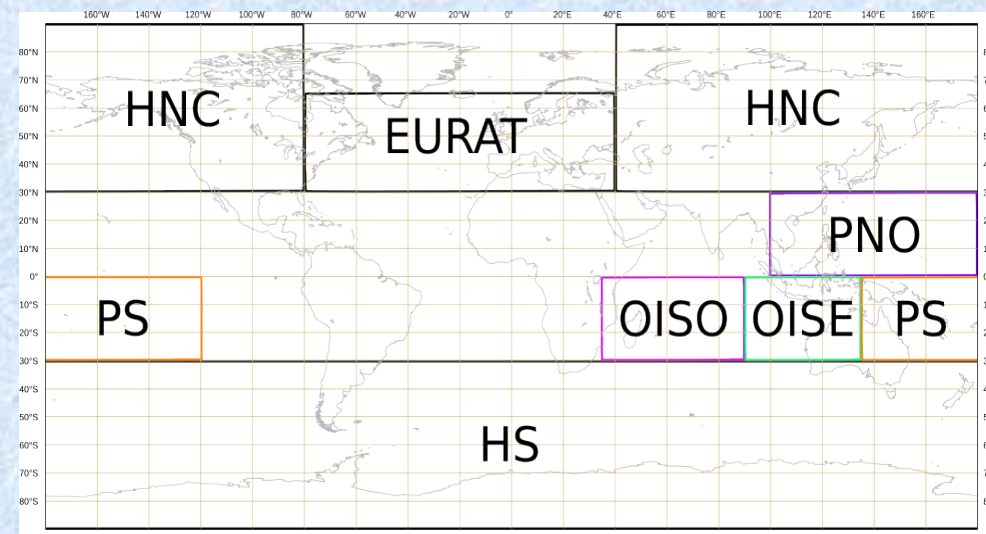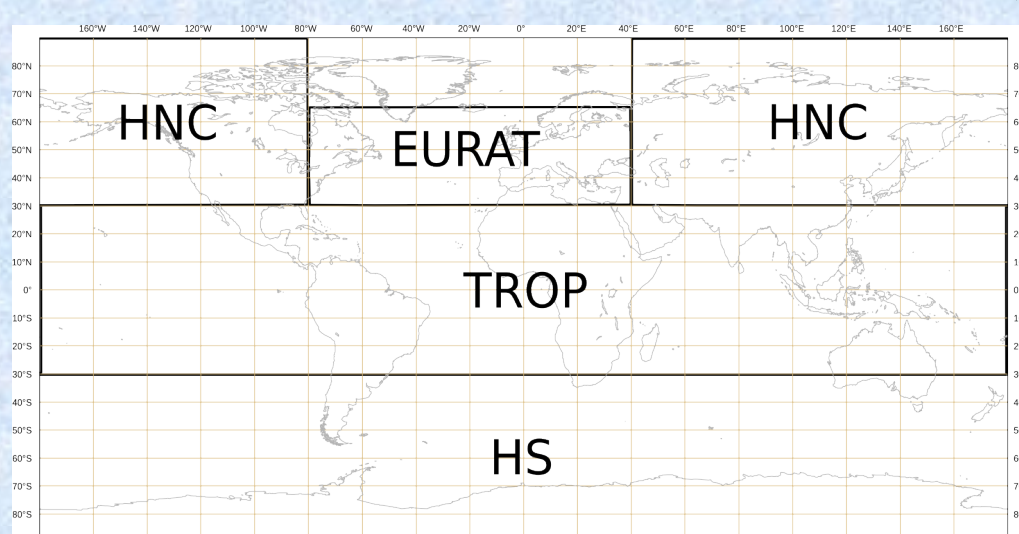Resolution PEARP3 T538L65C2.4 (~15km over France)

Fig. 5. Areas for dry singular vectors computations (left :PEARP2, right: PEARP3 for southern hemisphere)
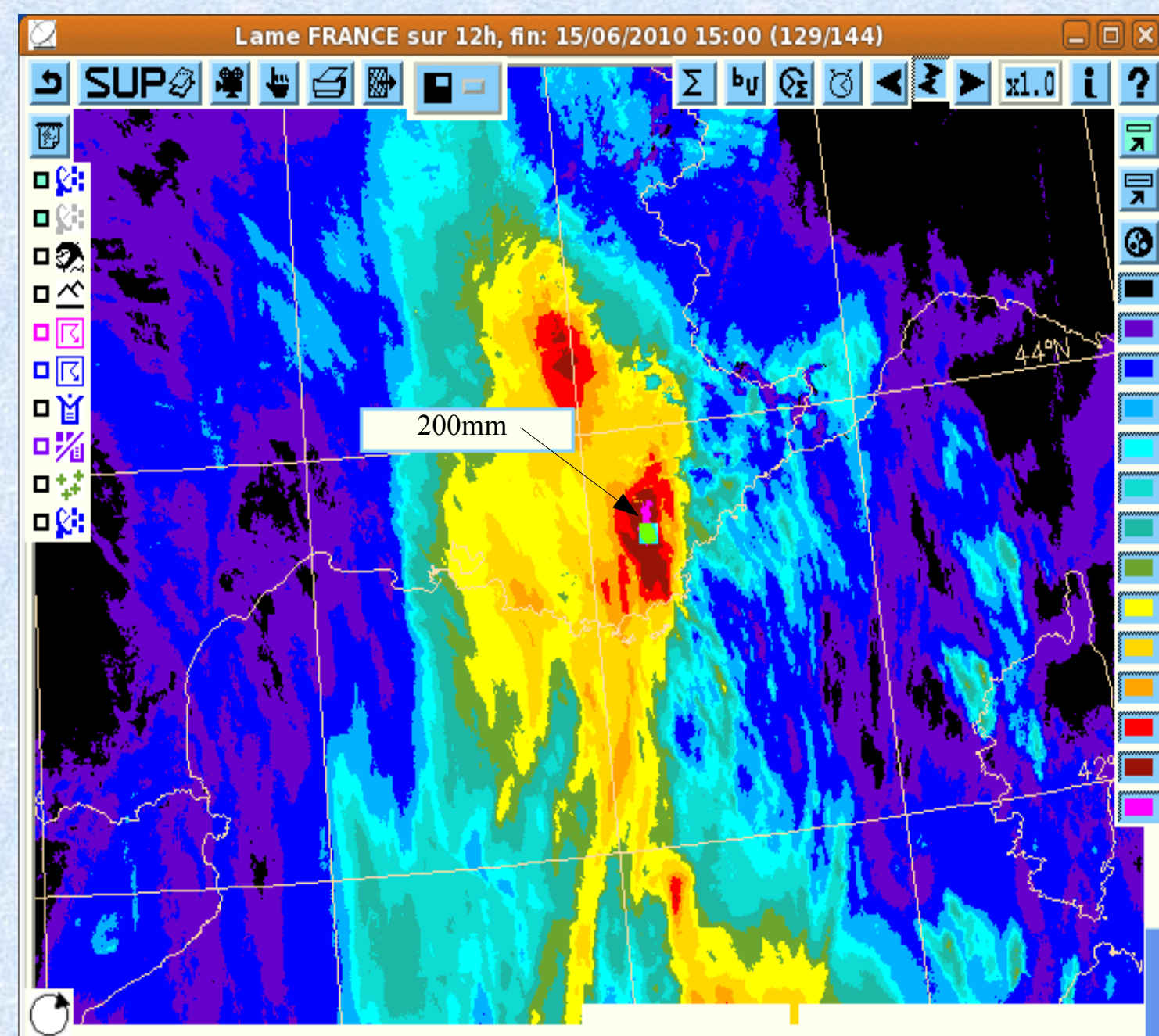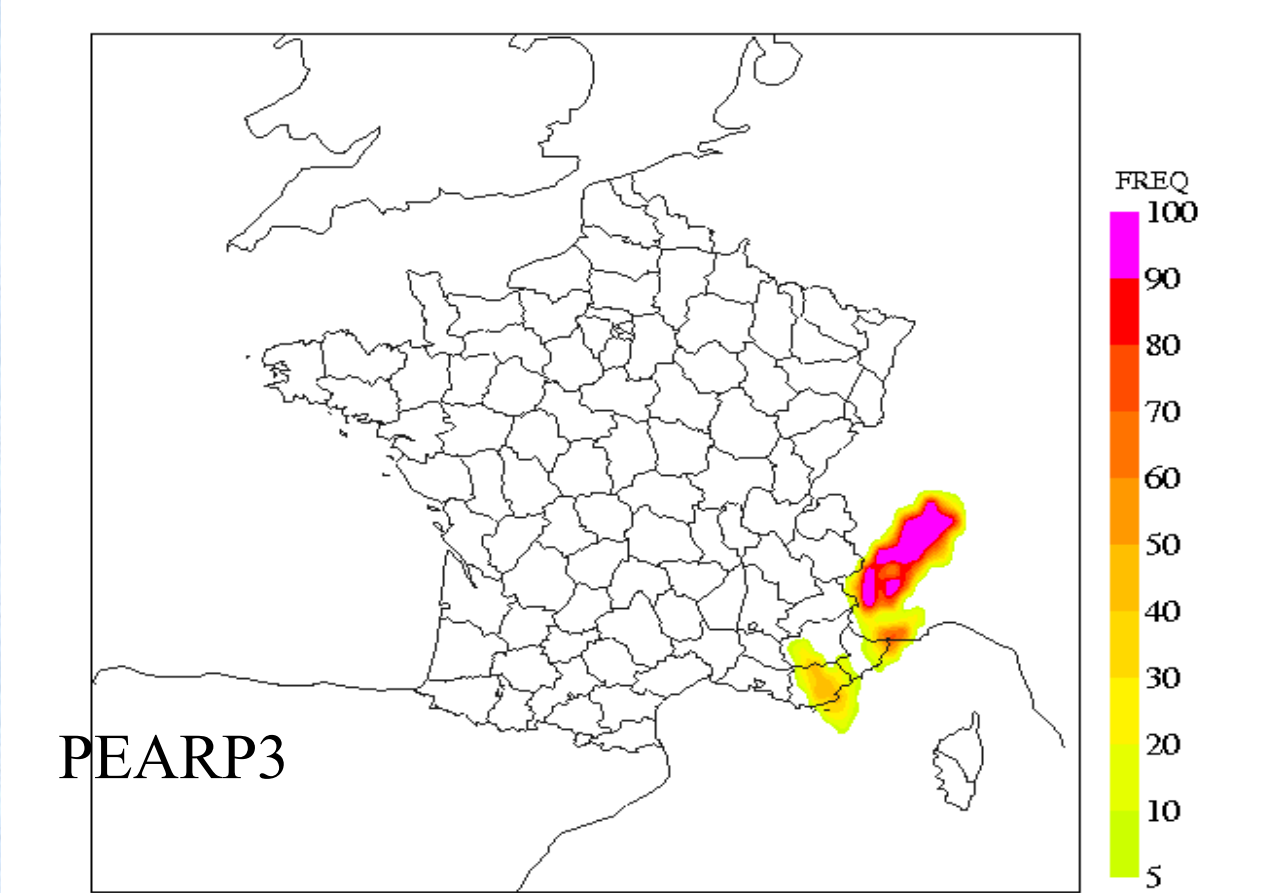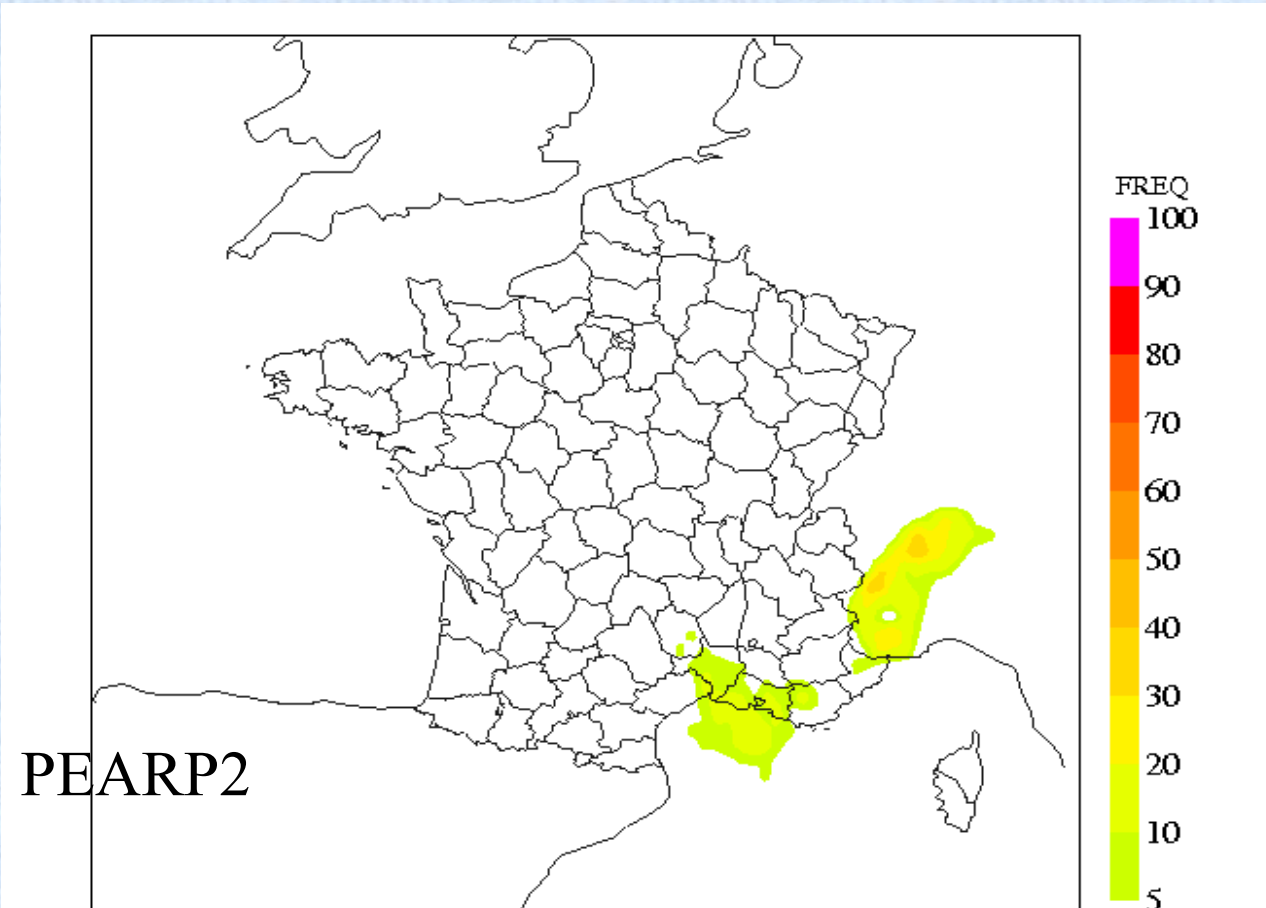

PEARP2

PEARP3

Fig. 6. Probability map for 30h rainfall > 100 mm on 15 June 2010

Changes in the AROME operational suite

Forecast model: French domain and cost issues

- 750x720 points per 60 vertical levels, with 2.5km horizontal gridmesh. The model time step is 60s. On 48 processors of the NEC SX9, 30h forecasts can be produced in 2400s elapse. AROME is hourly coupled with ARPEGE

- CY36T1_op2, oper since September 2011

- AROME is running on 4 daily production runs, for a 30 h range. Its assimilation is based on a 3 hourly RUC including radar data (reflectivity and doppler winds)

- Compared with the previous version changes concern :

• As in ARPEGE, more data assimilated (SSMI-S for example) thanks to data flow changes (data available earlier)
• Modification of cloud scheme in order to improve low clouds
• Hail diagnostic (based on vertically integrated graupel content)
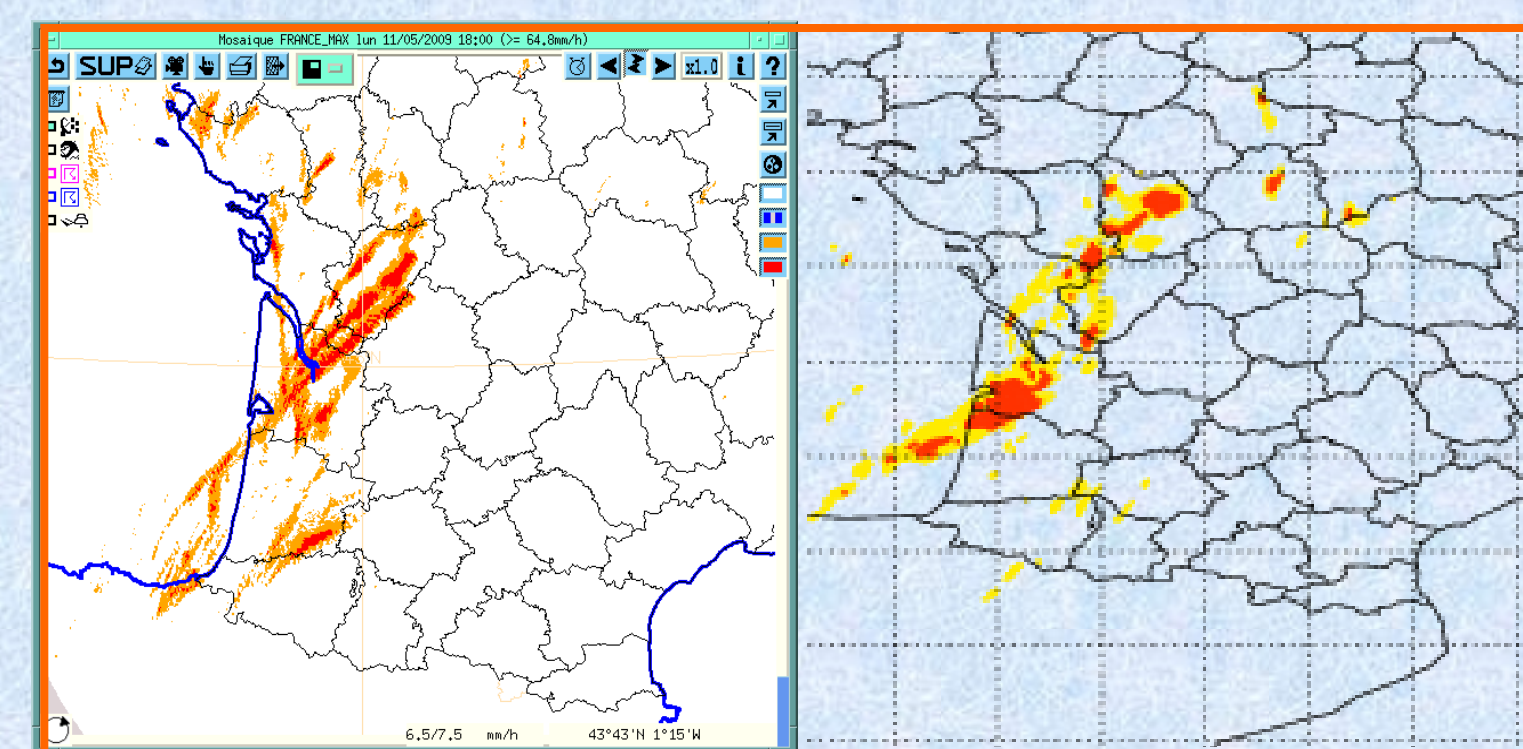

Fig. 7 : 11-may 2009, left : Hail detection based on radar observation, right : AROME Hail diagnostic
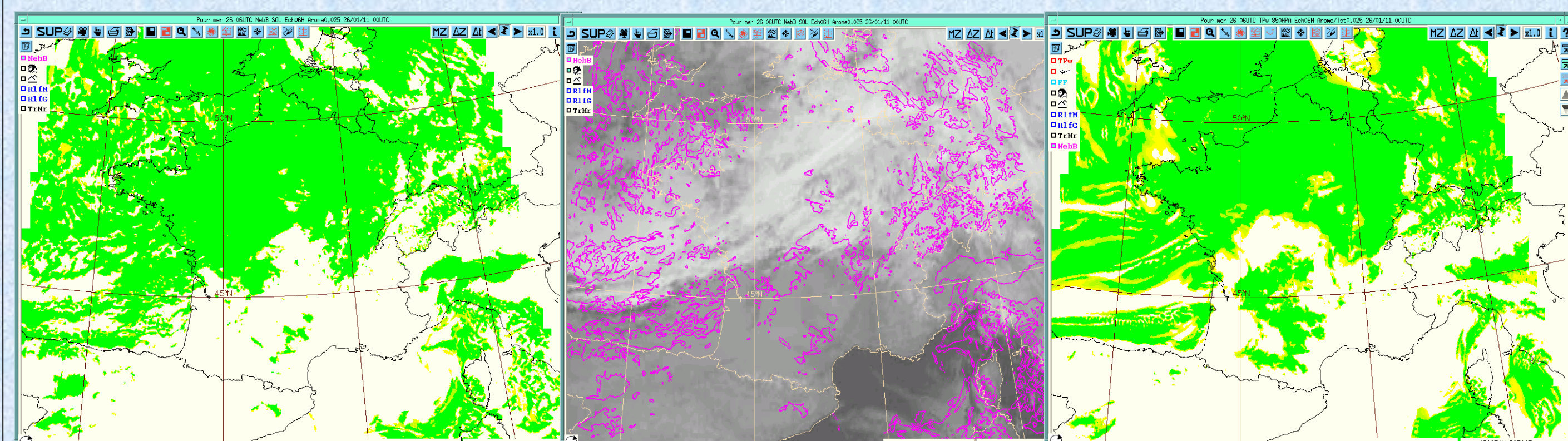

Fig.8. Comparison of low level cloudiness for 26 January 2011 +6 TU. left :old AROME-oper, right current AROME-oper, middle : Satellite observation and old AROME-oper

Next e-suite : in CY37T1_op1, by the end of 2011 : Modifications of cloud scheme, surfex v6+, ...