

## The ARPEGE/ALADIN System travels overseas ...

### 4 Overseas Aladin Models : general features

4 Aladin models with 3D Var assimilation, called Overseas Aladin models, are in operations over the following French territories : La Réunion, French Antilles and Guiana, New Caledonia and Polynesia (cf. Figure 1 for the domains). The grid-mesh is 8 Km and the vertical dimension is discretized in 70 levels. During a forecast, these models are coupled with ARPEGE or IFS depending on the domain, every 3 hours. The timestep is 450 s to have an even number of iterations for 1h. 2 runs are performed operationally each day at 00 and 12 UTC. Forecast terms are between 54H and 84H depending on the domain.

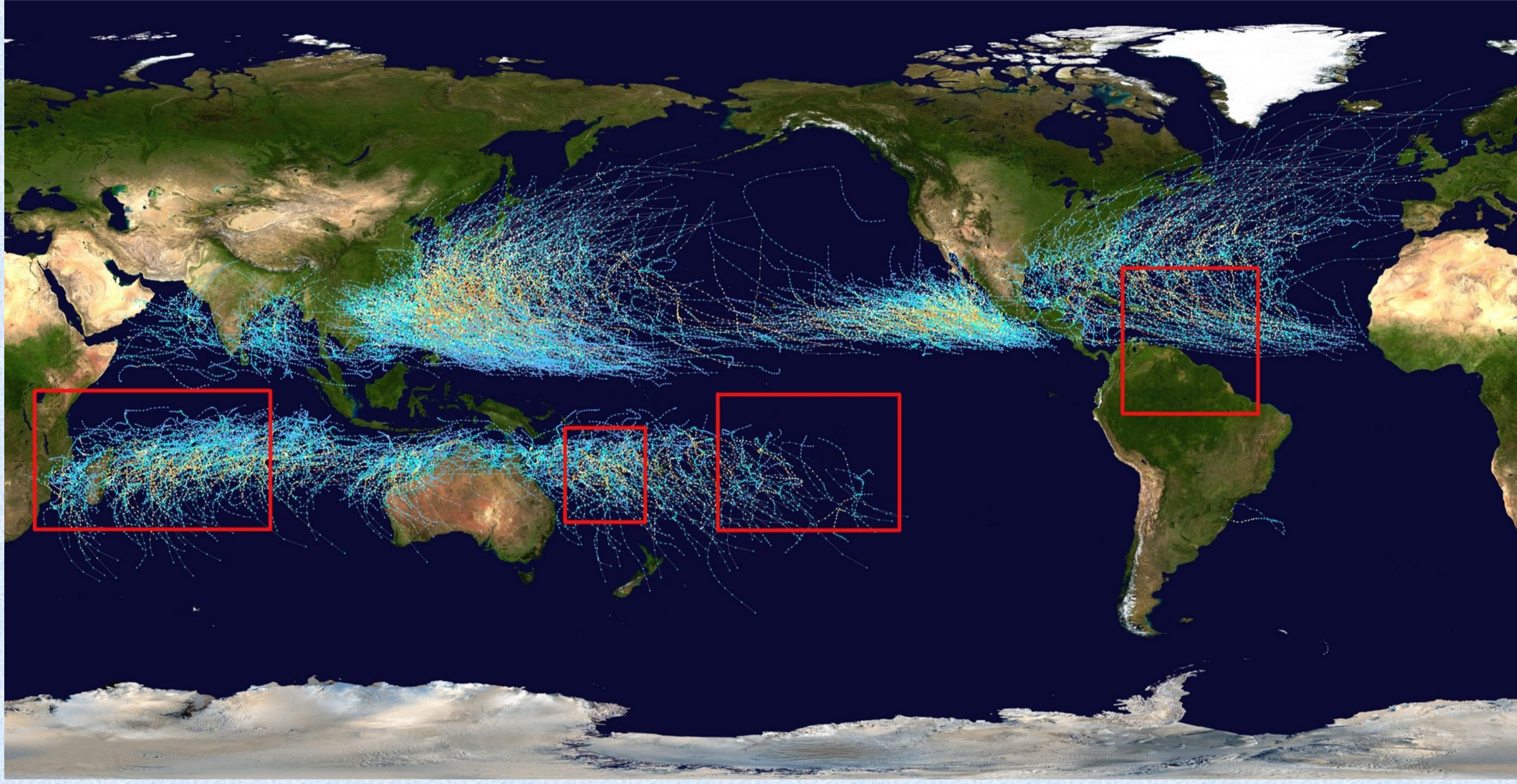


Fig. 1. Post processing domains of the 4 overseas Aladin models : background : a global tropical cyclone climatology map

#### 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.

#### Assimilated observations are :

- Surface pressure and SHIP winds
- T2m and RH2m, 10m winds
- Aircraft data
- Drifting buoys surface pressure
- Soundings (TEMP, PILOT)
- Winds from AMV (SATO) and scatterometers
- GPS (ZTD and radio occultation)
- Satellite radiances: AMSU-A, AMSU-B, HIRS (NOAA and METOP), clear-sky microwaves over land, cloudy AIRS, IASI (sea/land/sea-ice), AQUA/AIRS channels (~54)

## 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 background error variances of the day consistent with the 4D-Var assimilation cycle
- Model perturbations : multi-physics (9 physics +ARPEGE operational physical package)
- Resolution PEARP3 T538L65C2.4 (~15km over France)

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

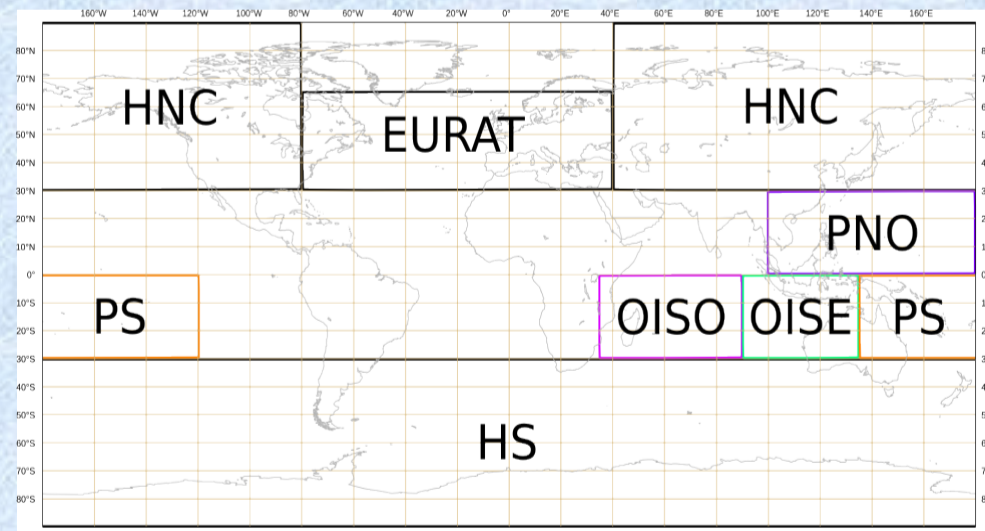
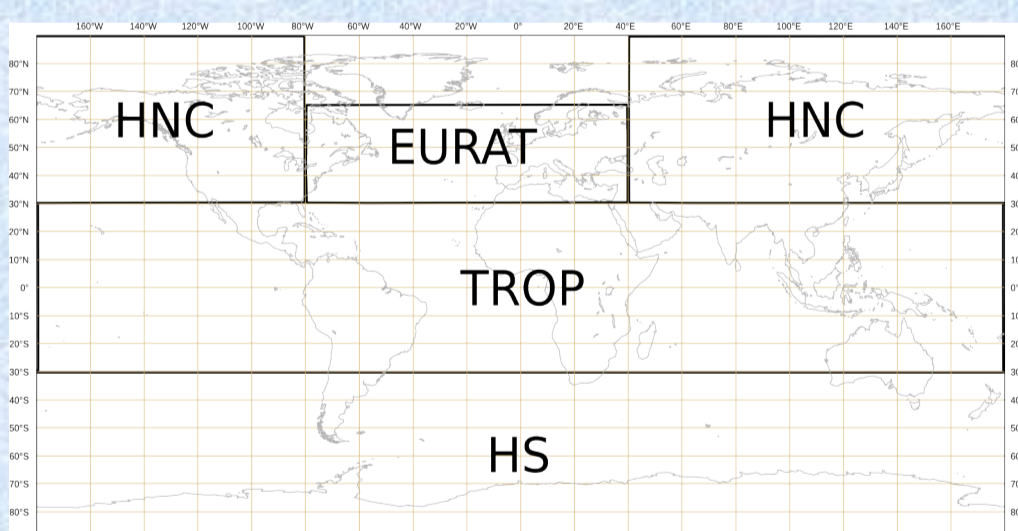


Fig. 5. Areas for dry singular vectors computations (left :PEARP2, right :PEARP3 for southern hemisphere)

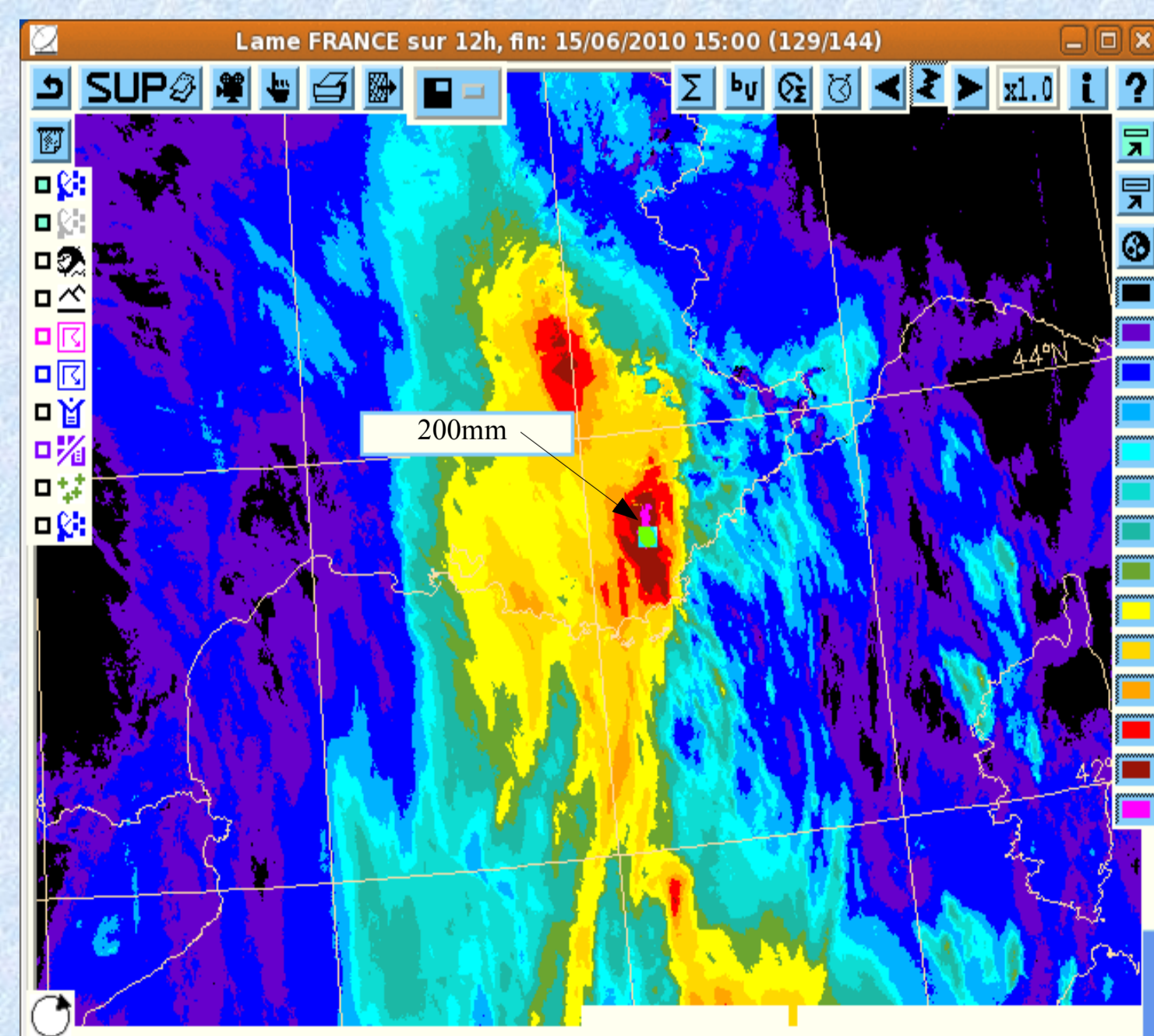
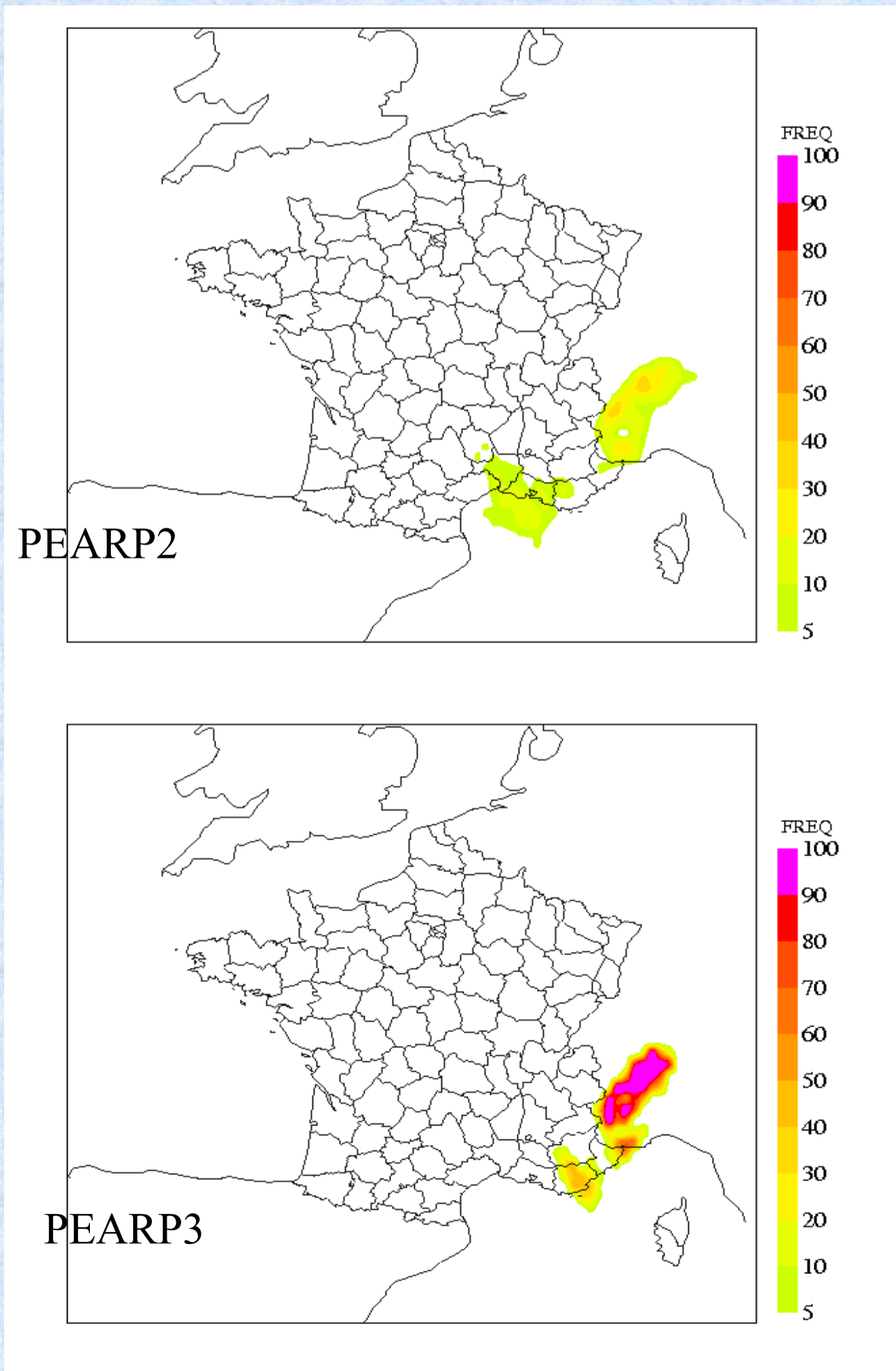


Fig. 6. Probability map for 30h rainfall > 100 mm on 15 June 2010

## 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.

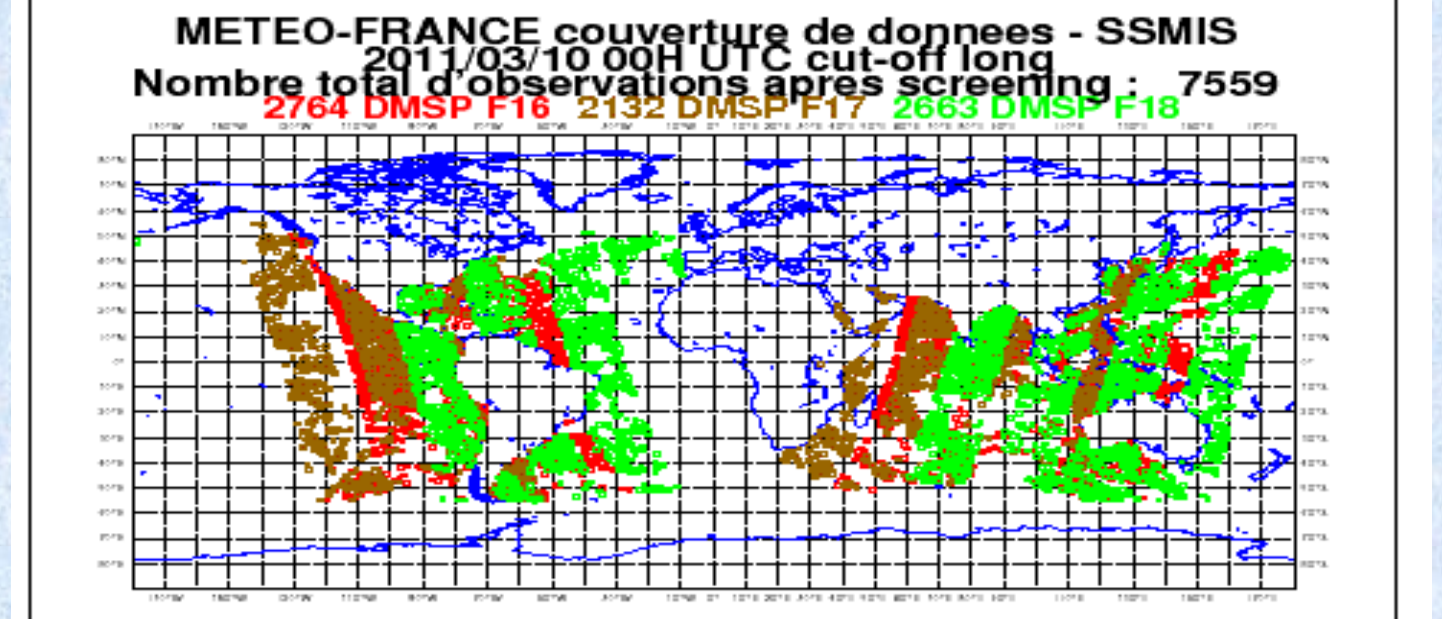


Fig. 2. SSMI-S observations (F16/F17/F18) assimilated in the 4D-Var analysis in the E-suite (10/03/2011 at 00 UTC).

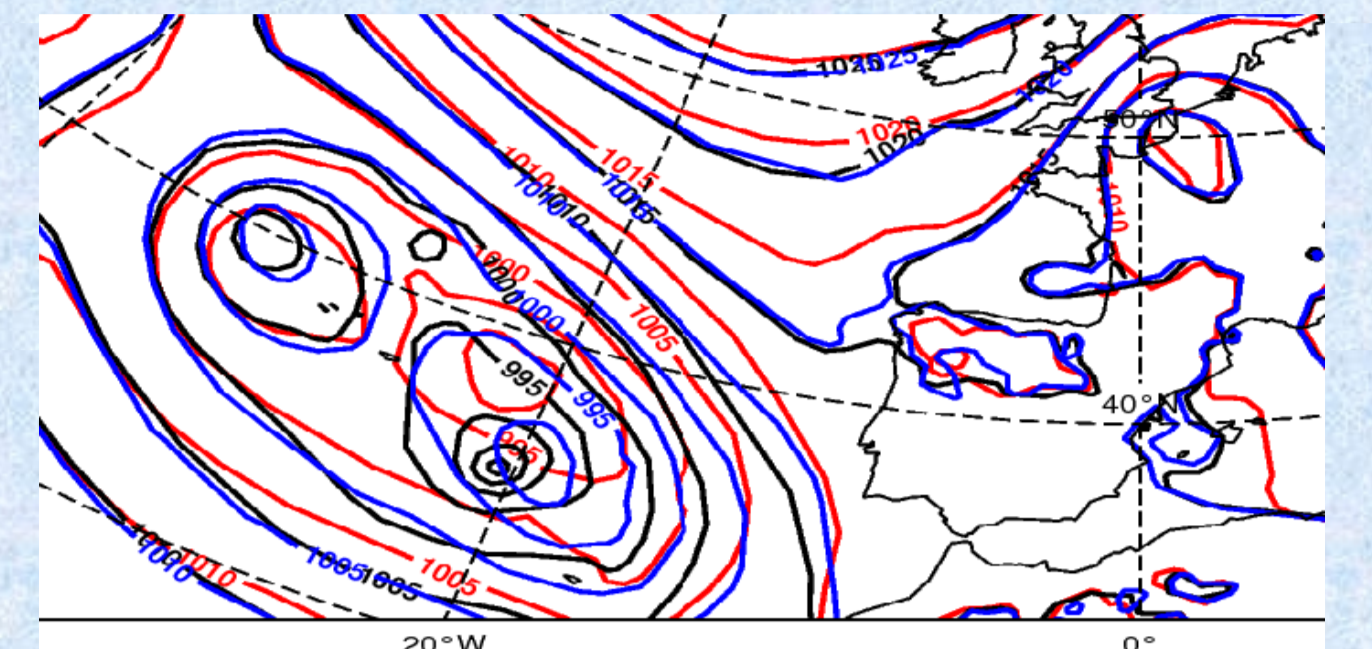


Fig. 3. Mean sea level pressure valid 18/12/2009 at 00 UTC. Analysis (in red) and 24h forecasts of the operational (in black) and e-suite (in blue) models, both starting from same initial conditions.

### The next operational suite will be based on CY37T1\_op1. It will include :

- Retuning of the observation errors for AMSU-A, GPS-RO and conventional data
- Assimilation of IASI cloudy radiances and 33 additional IASI temperature channels
- Assimilation of a large number of ground-based GPS
- Assimilation of ASCAT and IASI data from the EARS network
- Inflation of background errors to take into account model errors
- Improvement in convection scheme

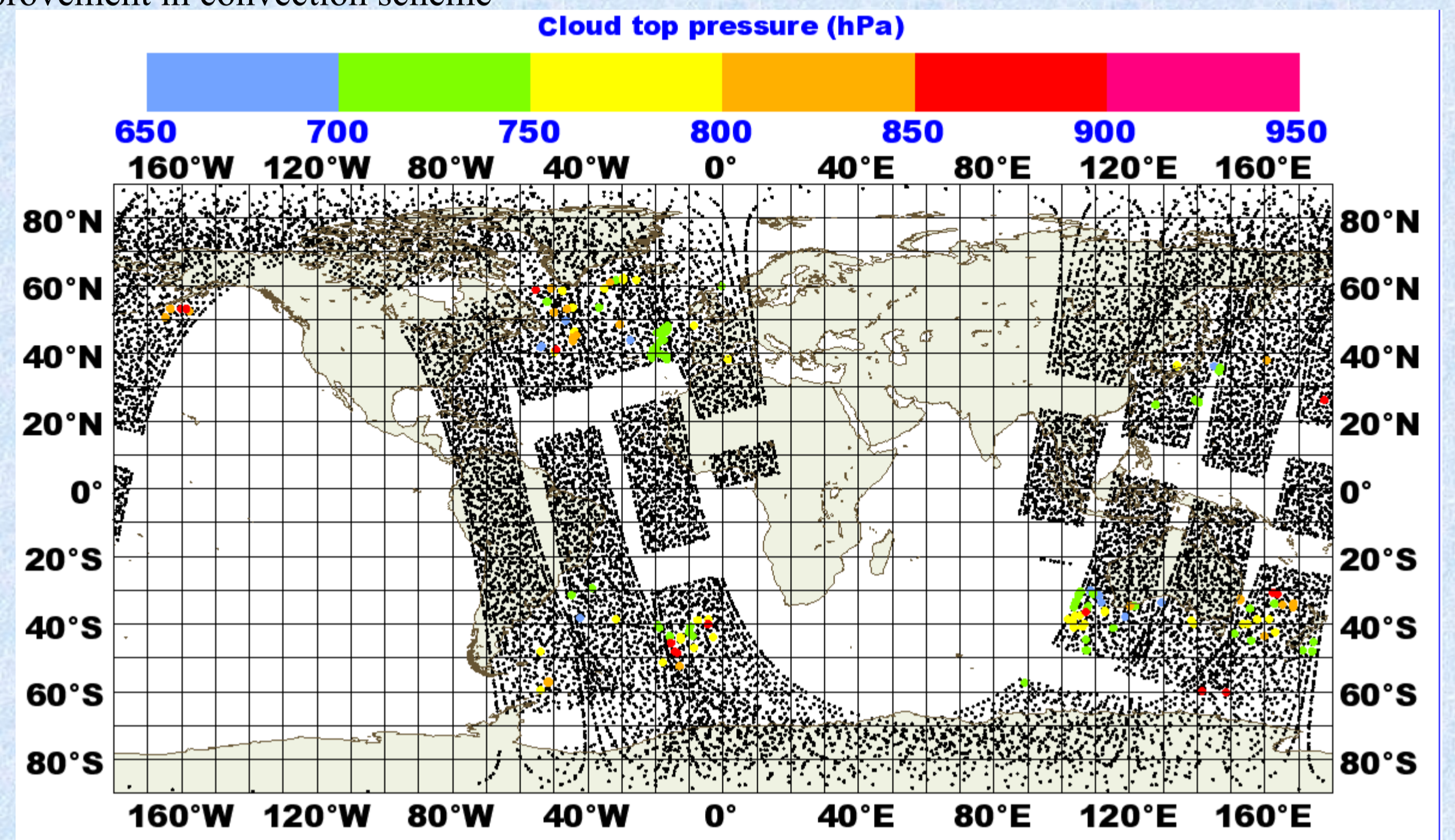


Fig. 4. In color, the added IASI cloudy observations following the conditions : totally cloudy and cloud top between 650 and 900 hPa

## Changes in the AROME operational suite

### CY36T1-op2, oper since September 2011 :

- 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 and 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 in cy36t1-op1 changes concern :

- As in ARPEGE, more data assimilated (SSMI-S ...) 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)

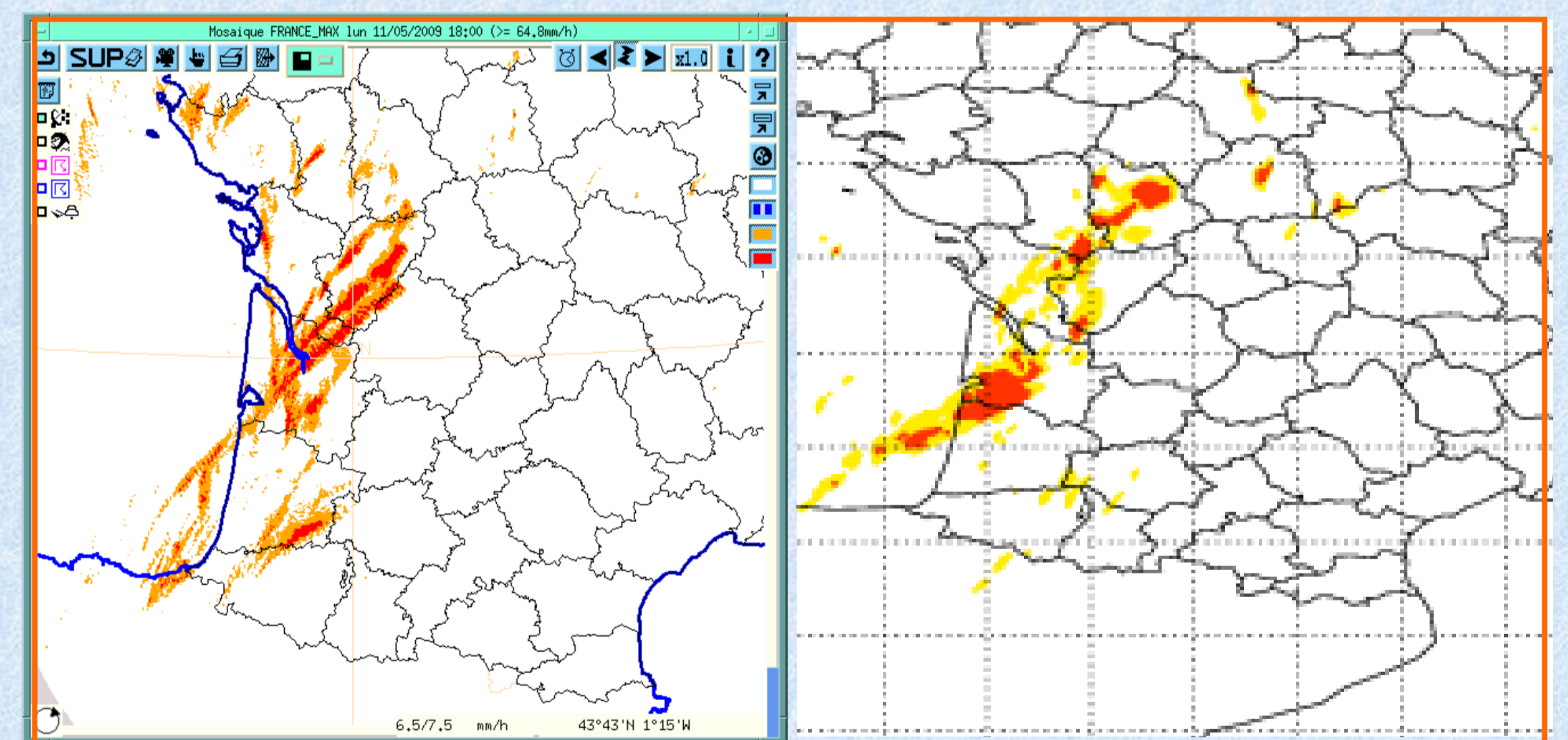


Fig. 7. 11-may 2009, left : Hail detection based on radar observation, right : AROME Hail diagnostic

### Current e-suite : in CY37T1\_op1:

- Modifications in shallow convection and cloud schemes
- surfex v6+ (optimisations)
- new clim files (clay,sand and orography).
- coupling of hydrometeors (to fix problems in coupling zone)

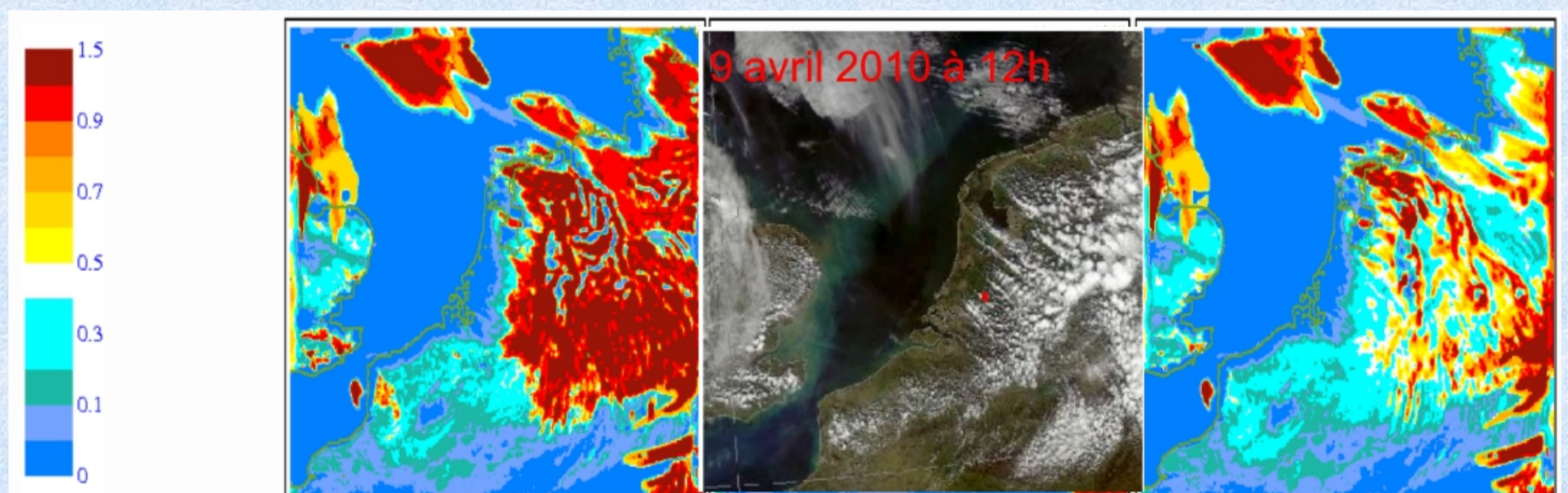


Fig. 8. Comparison of total cloudiness for 9 April 2010 +12 TU, right :AROME-oper, left AROME-37t1-op