

## 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 and 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.

### 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 scatterometers
- 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)

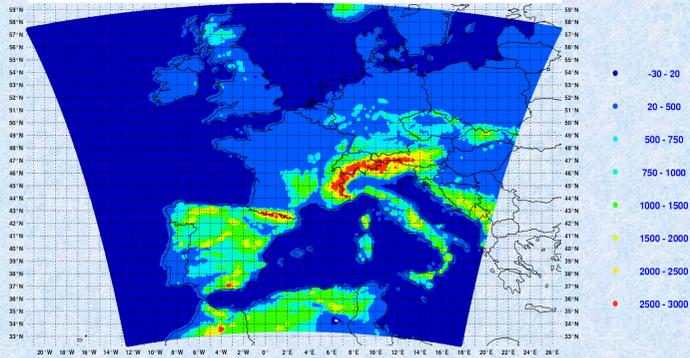


Fig.1. The ALADIN-France operational domain.

## Changes in the operational suite ARPEGE-ALADIN

The cycle for the operational suite is CY36T1\_op1. It has been running since November 2010.

### ALADIN-France

- Since second part of 2010 we have 3 new "extended zones" named Aladin-OM (Ostre Mer – over-seas)

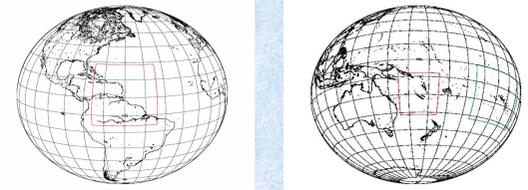


Fig. 2. Aladin-OM Domains (Antilles-Guyane, Nouvelle Calédonie, Polynésie)

## ARP-ALD current E-suite (January 2011-May?)

- CY36T1\_op2
- Assimilation of SSMI-S F18 and ATOVS/RARS (Regional ATOVS Retransmission Service) observations. New RTTOV coefficients for AIRS and IASI
- Model error taken into account in the "ensemble assimilation system" via an inflation technique of the perturbations.
- 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, Antigua, New Caledonia, Polynesia). Same SURFEX options used as in AROME (ECOClimap, ISBA-3L, etc) except TEB and CANOPY schemes for the time being.

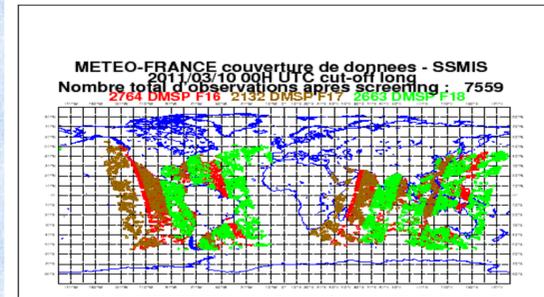


Fig. 3. SSMI-S observations (F16/F17/F18) assimilated in the 4D-Var analysis in the E-suite (10/03/2011 at 00 UTC).

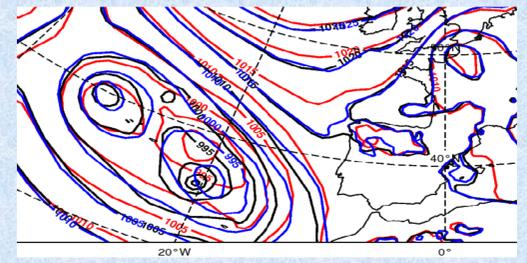


Fig. 4. Mean sea level pressure valid 18/12/2009 at 00 UTC. Analysis (in red) and 24h forecasts of the operational (in black) and e-suite (in blue) models, both starting from same initial conditions.

## Changes in the Arpege Ensemble Prediction system

### PEARP3 (operational version since December 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 computed by AEARP (Assimilation Ensemble ARPege)
  - scaled to an amplitude size using error variances background of the day consistent with 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	TI95	TE
HNC and HS	24	TI95	TE
TROP	18	TI95	KE

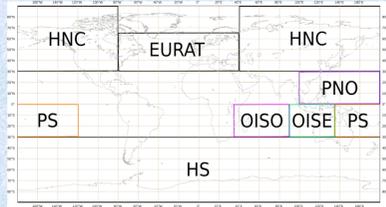
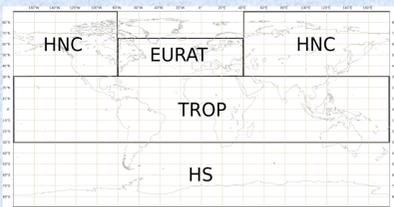


Fig. 5. Areas for dry singular vectors computations (left :PEARP2, right : PEARP3 for southern hemisphere)

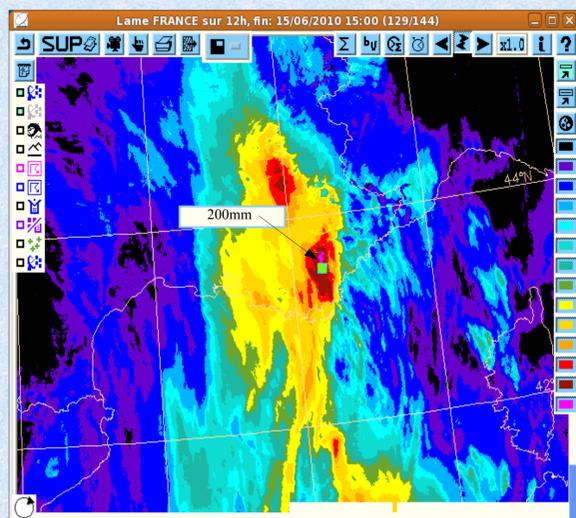
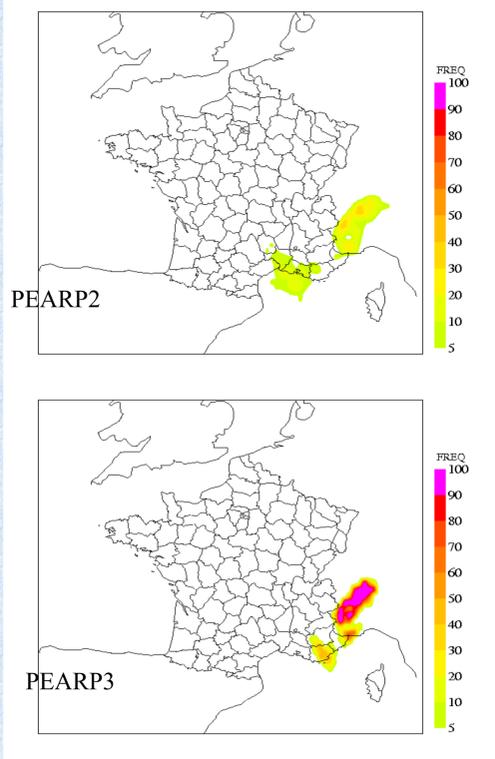


Fig. 6. Probability map for 30h rainfall > 100 mm on 15 June 2010.

## Changes in the AROME operational suite

### Forecast model: French domain and cost issues

- Since the end of November 2010, AROME operational domain is 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\_op1
- AROME version is running on 4 daily production runs, for a 30 h range. Its assimilation is with 3 hourly RUC including radar data (reflectivity and doppler winds)
- Compared with the previous version changes concerns, +76% horizontal domain, 80 km thinning for IASI, 25km for AIREP, assimilation of doppler winds from more radars, tunings for reflectivity retrievals, SURFEX surface analysis, code optimisation (EDKF, I/O), modifications of z0 (more friction over orography), diagnostics (PBL height, surface radiation fluxes, modelled satellite imagery)

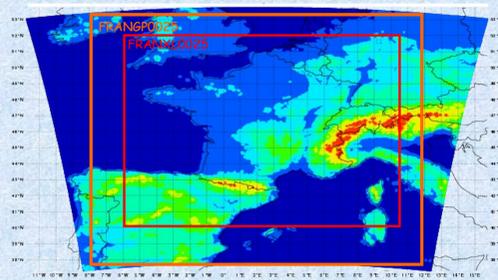


Fig. 7 AROME new domain orography and post processing domains (new, old).

### Current E-Suite: Arome V4 (spring 2011)

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

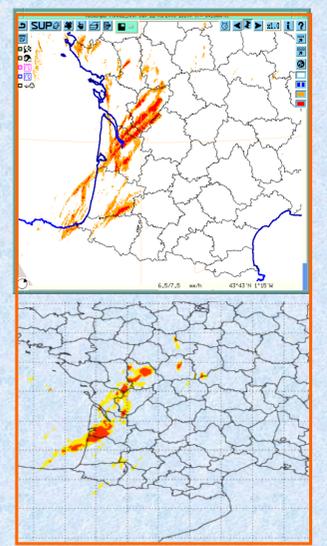


Fig. 8 : 11-may 2009, top : Hail detection based on radar observation, bottom : AROME Hail diagnostic

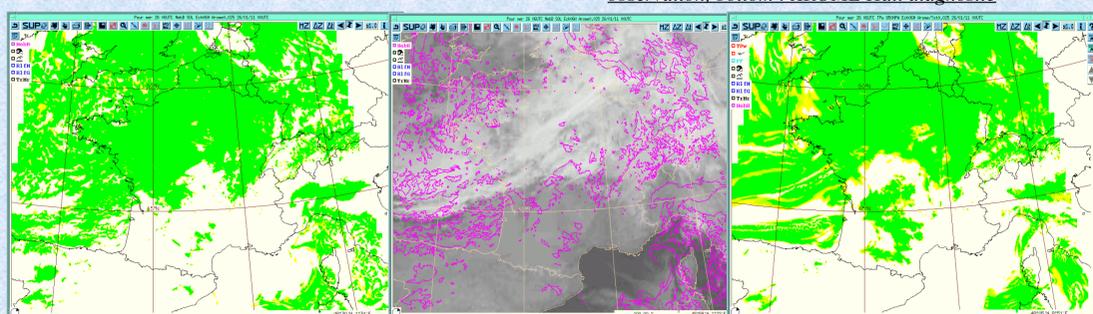


Fig. 9. Comparison of low level cloudiness for 26 January 2011 +6 TU. left : AROME-oper, right AROME-E-suite, middle : Satellite observation and AROME-oper