

## 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.

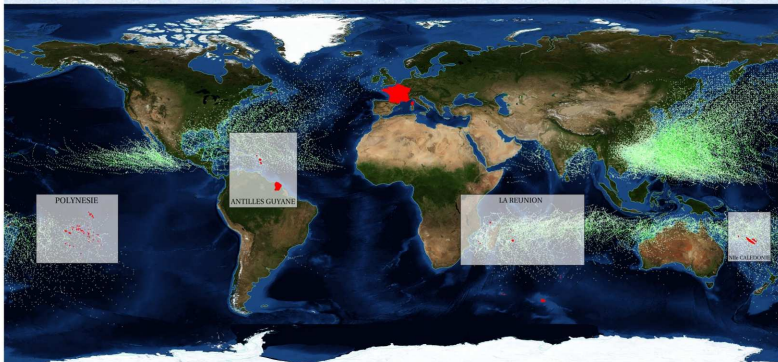


Fig. 1. Post processing domains of the 4 overseas Aladin models : background : a global tropical cyclone climatology map

#### 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)

## 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

HNC	EURAT	HNC
		PNO
PS		OISO OISE PS
	HS	

Fig. 4. singular vectors characteristics (left) and areas for dry singular vectors computations during Northern Hemisphere winter (right)

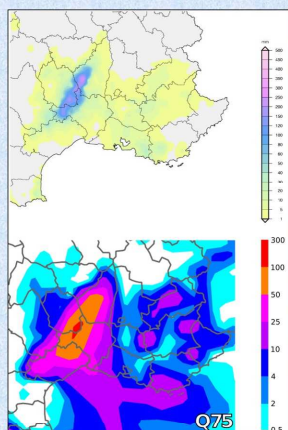


Fig. 5.

#### Up panel :

24h-accumulated rainfall observations on November 2, 2011 over the Southwest of France. 150 to 200 mm were observed over Gard, Ardeche and Lozere districts.

#### Bottom panel:

48h range forecast for the third quantile of ARPEGE ensemble prediction system (PEARP) and for 24h accumulated rainfall on November 2, 2011.

In other words, 25% of PEARP members forecasts that the 24h accumulated rainfall will reach at least the value drawn in the picture.

## Changes in the operational suite ARPEGE-ALADIN

The cycle for the operational suite is CY37T1\_op1.

It has been running since end of September 2012.

The modifications which became operational are:

- 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
- Assimilation of more buoys in SST analysis (larger time window)
- Inflation of background errors to take into account model errors
- Adjustment of latest modifications introduced in convection scheme
- Retuning of wind gust parameterization

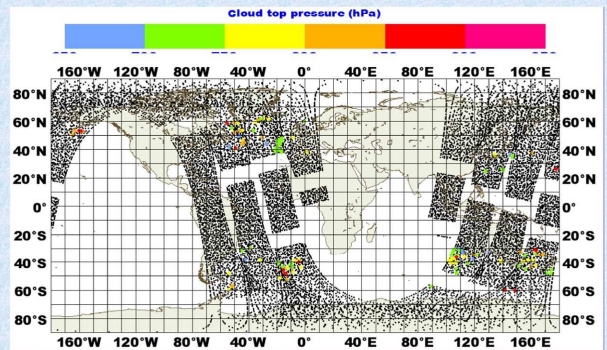


Fig. 2. In color, the added IASI cloudy observations following the conditions : totally cloudy and cloud top between 650 and 900 hPa

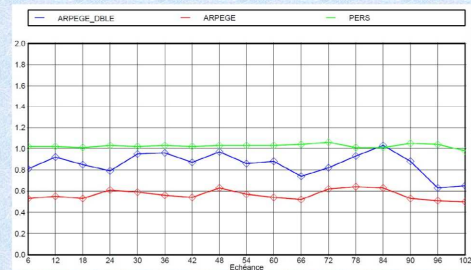


Fig. 3. Arpege forecast bias for 6h maximum wind gusts higher than 40km/h over France from 13<sup>th</sup> March to 9<sup>th</sup> Septembre 2010. No bias corresponds to one value. The old tuning is in red and the new one in blue.

## Changes in the AROME operational suite

CY37T1-op1, oper since end of September 2012 :

- 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 (except r12 +36h). Its assimilation is based on a 3 hourly RUC including radar data (reflectivity and doppler winds)

#### Compared with previous CY36T1\_op2 suite :

- 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)

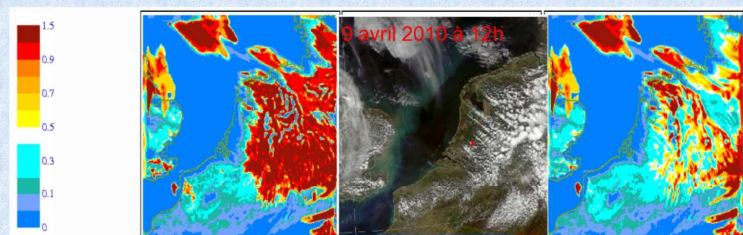


Fig. 6. Comparison of total cloudiness for 9 April 2012 +12 TU, right :AROME-oper, left AROME-37T1-op

## Starting work for future 2014 AROME-France-1.3km :

- Tests of various vertical discretisations around 90 levels (lowest model level at 5m)
- Stability tests with dt=45s, and Predictor-Corrector iterative scheme (NSITER=1) OK
- Ongoing evaluation over 3 months periods in spin up mode (winter 2011, summer 2012)

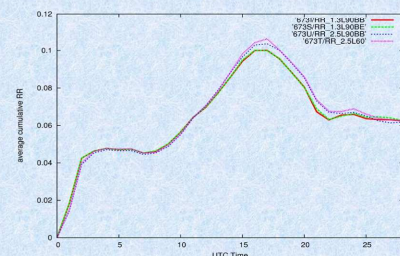


Fig. 7. AROME diurnal cycle of rainfalls from 1<sup>st</sup> June to 31<sup>st</sup> August 2012.