

Summer 2006 E-suite scientific description Switched on September 19th, 2006

ARPEGE

Reference cycle: CY30T1_op2

Observations :

Assimilation of SSM/I over sea and in clear sky:

Global scores are slightly positive, with a moistening of the PBL around 850 hPa in Equatorial regions (too dry in Arpège), a southward displacement of the ETCZ over Africa, and more stable precipitation amounts, with lead time, over the Northern Hemisphere extra-tropical latitudes.

Assimilation of ground GPS :

European ground GPS already were monitored. They are now assimilated in long and short cut-off runs. A slight positive impact over Europe is expected from experimental runs. MF are the first European NMS to assimilate these ground GPS operationally in their NWP system.

Assimilation of 20 channels AIRS + monitoring of 90 channels:

90 AIRS channels are monitored, and 20 stratospheric ones will be assimilated. This induces a significant cost increase in CPU, as about 3000 profiles are available at any run time. A positive impact in the stratosphere, especially in the Southern Hemisphere and in the Tropics, has been noticed.

Bigger vertical extension of profiler profiles:

Wind profiler data are now assimilated between 850 and 250 hPa , instead of 700-400, which gives about 70 % more data over Europe, with a positive impact over Europe and Northern America.

Algorithmics :

Balancing out the number of inner loops in 4D-VAR:

The couple of numbers of inner loops in the multi-incremental 4D-VAR is changed from 40/15 to 25/25. This is done at no extra cost, and seems slightly beneficial in scores.

Cycling of background error statistics (see also below):

Background error variances are computed daily from a Monte-Carlo method and with the B-matrix metric from the minimization as norm (Andersson et al, 2000). This technique produces maps of error variances that are consistent between screening (where they are used instead of simpler maps) and minimization. As a by-side product, it provides maps of background errors for each satellite channel.

Aladin E-suite

Observations :

-SSMI :

Now assimilated in clear sky over sea, like in Arpège.

-ground GPS :

The list of retained stations and the de-biasing values are different from Arpège (file "list_gpssol"). A new task "pre_gpssol" treats GPS data just before BATOR.

- wind profilers:

same as Arpège.

- no AIRS data in Aladin 3D-VAR !

Cycling of sigmab:

Same new sigmab maps are used for Aladin screening than for Arpège (thus, large scale flow-dependency according to the Arpège B metric).

Lamflag in bator :

LAMFLAG and REDUCE tasks have been inserted inside BATOR, which considerably simplifies the Aladin observation sequence for 3D-VAR..

Cycling of « sigmab » in 4D-Var ARPEGE and 3D-Var ALADIN

12/07/2006

1. Principle

The goal is to better specify sigmab's used in the screening. Sigmab's are now obtained as a statistics through perturbations in observation space. These perturbations are normalized by the B-matrix, and therefore they are consistent with the sigmab's from the minimization. They depend on the flow since B has the Omega and NL-balances (in Arpège) which are flow-dependent. Perturbations for satellite channels also are flow-dependent, as the observation operators include a dependency upon the state of linearization.

Sigmab's are produced on a T107 grid, and the files can be read both by Arpège and Aladin screening. 6 random realizations are performed to compute the statistics. For radiances, the following channels are computed:

- HIRS (4-7, 11-12, 14-15)
- AMSU-A (5-13),
- AMSU-B (3- 5),
- SSMI (1-7).

The procedure is not applied to AIRS, SEVIRI channels, where fixed values from the "fgchk" routine are used. Also, ground GPS are not treated.

Due to the small size of the ensemble, the sigmab maps need to be filtered in order to reduce the level of irrelevant noise.

2. production of random sigmab maps

diag_sigmab is a C131 configuration with the following modifications in namelist:

- T107 first guess input,
- namelist modset:

```
&NAMVAR  
LAVCGL=.TRUE.,  
NBGVECS=6,  
LBGTRUNC=.TRUE.,  
LWRISIGB=.TRUE.,  
LBGOBS=.TRUE.,  
NITER=1,  
NBGTRUNC=42,  
/  

```

diag_sigmab produces a GRIB file *sigma_b* readable in **screening**.

3. Modification of screening

In both Arpège and Aladin screenings, the errgrib file is now associated with the new *sigma_b* file, produced at the previous run time (instead of *var.errgrib.20031211.01.scr00*).

