Development of atmospheric data assimilation algorithm

Roger Randriamampianina and HIRLAM DA group

Core DA schemes

➔ 3D-VAR will still remain as assimilation system for most of centres:
- develop algorithm(s) that able to introduce weather and flow-dependent background error covariances;
- perform sensitivity studies;

➔ Affordable/(cheap) 4D-VAR at convection-permitting scale:
- optimal setting of assimilation window;
- evaluation of weak constraint DFI;
- application of multiple outer loops;

➔ At a longer time scale – 4DEnVar system suitable for both data assimilation and ensemble prediction;
- to explore (the best) localization technique to extract local information from the ensemble of perturbations (Météo France and HIRLAM have well documented solutions);
- need of rich ensemble system;
- need of system which treats wide range of scales.

Optional DA schemes

➔ EDA – observations perturbation based system:
- tuning/control of observation errors (including correlation);
- (optimal) observation types for the model domain and region;

➔(L)ETKF –
- explore localization techniques;
- Use of (L)ETKF for ensemble re-scaling to be used for Hybrid Var-Ensemble and EPS, and to be compared with alternative schemes like EDA.

➔Nowcasting systems:
- hourly non-cycling 3D-VAR – rapid refresh;
- Image warping, field alignment, cloud initialization: (combining these tools with variational or nudging schemes)

➔Accounting for large scale info – Jk, large scale mixing (LSM), DFI blending:
- Jk: debugged and tested with the ALADIN physics;
- LSM: in use widely in HIRLAM;
- DFI blending: in use in LACE;

Cooperation and working environment

➔ Common working framework for development:
- same cycle;
- same code environment (constrained by OOPS);
- collaboration with ECMWF;

➔ Define and develop tools that can be common for all consortia:
- ex: can we build a flexible (for research and operational application) ECFlow environment, a basic/default namelists for DA (OOPS and for miltraillette)?

➔ Share experience and agree on common/shared sensitivity and impact studies (video meeting is good platform for these activities, some actions have been already taken);
- There are 5 (radar data processing; conventional data and COPE; algorithmic issue; radiance data assimilation; use of retrieval data) video webrooms created;