Working group session 1 (data assimilation and observations)

LAM 4D-Var data assimilation : discussions on the boundary conditions (coupling strategy and extension zone). There is now a consensus between ALADIN and HIRLAM on the use of Mariano's solution (reorganization of the LAM bi-periodisation in order to avoid grid point computations in the extension zone) together with the Boyd's coupling solution. This will allow flexibility since the two aspects are separated. The reorganization of the bi-periodisation affects the way the coupling data are processed, but it should not be an issue if in the future one would like to control the boundary conditions.

Radar data assimilation : fruitful ALADIN-HIRLAM working week at MetNo in March for the use of radar data (doppler winds + reflectivities) in HARMONIE (presentation of Martin Gronsleth). The importance of the quality control of the data (eg cleaning of ground clutter echos) before assimilation has been stressed. The problem of data exchange between Norway and the other HIRLAM member countries has been discussed. It has raised the issue of data formats (HDF5 should be supported in less than a year). It has been agreed that the problem of data exchanges and (gross) quality control should be addressed (managed) within the EUMETNET OPERA programme. *Action of Andras to provide the SRNWP needs (?)*

Joint work on Jk : Encouraging results from Per Dahlgren in HIRLAM. The methodology is somewhat different from what has been done on the ALADIN side by Vincent Guidard : use of a 3h forecast instead of an analysis, penalty term only on vorticity (but with all scales). The approach will be used in the FP7 EURO4M reanalysis (using ERA Interim in Jk). No strong interest of ALADIN on Jk (except at the CHMI where it could replace the current blending technique based on DFI). The Jk term can be used in HARMONIE (since it is based on the Jb structure its maintenance is easy)

Flow dependent background error statistics : A number of approaches a currently under evaluation within ALADIN and HIRLAM (heterogeneous structures functions based on a rain/no rain mask, hybrid approach with Jb partly provided by an ETKF, ensemble variational data assimilation with perturbed observations[eg presentation of Maria Montero] and the representation of the B matrix by wavelets [talk by Alex Deckmyn]). The importance of smoothing local variances has been underlined by L. Berre (filtering techniques at Météo-France, weighting between static and ensemble B + localisation at MetNo). An inflation term for describing model errors is needed in both the ETKF and the EnVarDA approaches (use of a-posteriori diagnostics for the tuning at Météo-France; mulitplicative and additive terms at MetNo). It has been agreed that these various approaches should be explored in parallel and when going to higher resolutions a common (hydrid ?) choice would have to be made (that could also be dictated by scalability issues on massively parallel computers). The work of ECMWF developing a weak constraint 4D-Var with long windows (as well as their parallell development of an EnsKF) has to be followed in order to help our future choices.

Mode-S observations: The presentation given by Sander Tijm (on behalf on Siebren de Haan) on the use of wind observations close to airport areas (deduced from frequent airplane radar positions of air traffics controls) in a rapid update cycle assimilation system was found very encouraging. Discussions have been focused on the availability of such data (should be provided like AMDAR reports) and about their cost. Humidity data are also available from a number of equipped planes (not enough currently in Europe for experimentation; the fleet should be significantly extended within 2 years). *Action at the EUMETNET level for getting such data ?*

OOPS (Object Oriented Prediction System) : Claude give information about the OOPS project that

has started at ECMWF (to advertise the presentation he will give on Thursday). The new planned structure will include structure elements in C++ that should better match theoretical elements (mostly DA but also other applications such as Singular Vectors). Data assimilation in ALADIN and HARMONIE will be affected by these changes. It is important for our community to keep an eye on the ongoing developments in particular concerning the geometry constraints imposed by the LAMs.

Analysis of lake surface temperatures, lake ice and sea ice in CANARI: The analysis of sea and lake surface conditions in CANARI is quite poorly developed. As an example, sea surface temperature observations (from the sea) are influencing also the state of the inland lakes. A pre-requisite for a better treatment of lakes is introduction of a lake model (Flake) and a lake data base (lake depths) in SURFEX. For this purpose the prognostic variables describing the state of the lakes need to be defined. At least for Nordic conditions, the most important effect of the lakes is to be able to distinguish between frozen and non-frozen lakes. Satellite observations (e.g. MODIS) are considered to be most important source of information for initialization of the lake models.

Snow analysis and related issues: A workshop on modelling and assimilation aspects on snow was arranged in Kuopio, Finland (April 2010). Presentations and documentation of the workshop are available at http://fmi.fi.netfam/SNOW.

Need for a general strategy to surface and soil assimilation: At present the number of different types of observations that influence the surface and soil assimilation is quite limited. Special tools for input of each new type of observation, for example by selection of the satellite image pixel closest to each model grid point, is acceptable in this situation. The question arises, however, how the calculations should be organized in the future when the number of useful remote sensing observations increases. *Do we need a general surface and soil assimilation tool like we have for the upper air assimilation*, organized around an observational data base like the ODB, that is able to provide weights to the different types of observation in accordance with their estimated accuracies/ content of information (a "filter"). The answer to this question is not clear at present.

Screen level analysis in CANARI: The statistical model used by the 2 meter temperature and relative humidity analysis in CANARI needs to be improved, in particular to take hetereogeneites and anisotropy in coastal and mountainous areas into account.

Need for a general spatialization tool: One important aspect of the surface and soil assimilation is the spatial interpolation and filtering (spatialization) of information from irregularly distributed observation networks. Rather old OI-based software packages like CANARI and SPAN (MESAN) are applied at present. There is a general need to develop a more more modern tool making it possible to take heterogeneous and anisotropic structures into account. An opportunity to develop such a tool has arisen within an EU project for atmospheric re-analysis over the European domain, including a 3-year post-doc position at Météo-France, dedicated partly to such a spatialization, and with a start from September 2010. Much would be gained from a development of a joint spatialization tool for re-analysis and for NWP. Details to be further discussed are, for example, (1) regional and global geometries for the output or only regional geometry; (2) the observational data base (ODB?); (3) possibility for joint effort with the ECMWF; (4) constraints imposed by the OOPS (Object-oriented prediction sytem) action.; (5) interpolation and filtering algorithms (OI, wavelets, use ensembles,..) to be applied.