

AROME-ALADIN special workshop

April 11-12, 2003, Prague

2 - Variational algorithms in ALADIN

The development of a variational data assimilation system in ALADIN dates back to 1997 when the first steps to adapt the 3d-Var scheme of the global ARPEGE model were taken. Since that time, work has been carried out in order to shape the system to be an efficient meso-scale application. The three main research directions that were followed are the design of an assimilation cycle method, the development of background error statistics suitable for the meso-scales and the use of new observation types. Shortly, in the research on assimilation cycles, an efficient method has been designed and validated which is able to merge the valuable large scale fields from the ARPEGE analysis and the local 3d-Var analysis fields (DFI-Blending, BlendVar). Also, investigations were done to make an optimal choice of initialization and coupling methods in the assimilation cycle. Concerning the development of meso-scale background error statistics, the so called constant coupling lagged-NMC method has turned out to be a promising tool. The research on background error statistics is now going on in order to include inhomogeneous and anisotropic features in the statistics. In the research on the use of new types of observations, many efforts have been made to assimilate aircraft and satellite data (raw radiances from ATOVS data), and the list is being continued with the use of pseudo-profiles of relative humidity from Meteosat imagery and with the use of radar data. One tries to carry out the developments in each field hereabove side by side as the three research directions are highly dependent on each other. It is worth to notice that, in the area of observation handling and interpolation, probably nothing could have been possible without the software compatibility with ARPEGE/IFS. This remark also holds to a lesser extent for the other algorithmic pieces of the 3d-var.

Since the beginning of ALADIN 3d-Var developments, the scheme has been implemented in several member states within the project, enabling local research and experiments. Now, in several ALADIN countries, 3d-Var is running and is being validated daily in a pre-operational frame (Morocco, Hungary) or steadily maintained for research purposes (France, Czech Republic). These systems can differ in issues concerning the assimilation cycle, but they are all build on the same ALADIN 3d-Var scheme.

The future development of variational data assimilation in ALADIN will still concentrate on the meso-scale applicability in each research directions listed above which is definitely needed considering the expected interaction of ALADIN and AROME projects, as the future AROME model is planned to resolve very fine scales (below 2km). In addition, a new research direction is planned to follow, namely the direction towards 4d assimilation (more realistic assimilation in time). The first step towards continuity is planned to be taken soon with the implementation of 3d-FGAT (FGAT: First Guess at Appropriate Time), a method that enables to take into account observational data close to their real observation time still in the 3d-Var framework.