

## **Minutes from the working week on**

### **HARMONIE data assimilation**

**Oslo 5 - 9 May 2008**

**Participants:** Nils Gustafsson, Magnus Lindskog, Mariken Homleid, Ole Vignes, Trygve Aspeli, Reima Eresmaa, Kirsti Salonen, Xiaohua Yang, Maria Diez, Carlos Geijo, Vincent Guidard, Jeanette Onvlee, Roger Randriamampianina, Sigurdur Thorsteinsson, Alena Trojakova and Eoin Whelan

#### **1. Introductory lectures**

The following introductory lectures on the HARMONIE data assimilation were given:

Vincent Guidard: Lecture on ALADIN 3D-Var theory

Alena Trojakova: Lecture on the CANARI optimum interpolation with emphasis on technical aspects

Roger Randriamampianina: Lecture on the data flow in HARMONIE data assimilation

Xiaohua Yang: Lecture on the HARMONIE script system for data assimilation

Magnus Lindskog: Review of the HARMONIE 3D-Var work

Maria Diez and Mariken Homleid: Comparisons between the CANARI and the SPAN surface analysis schemes

The presentations are available at

<https://hirlam.org/trac/wiki/HarmonieDAWorkshop200805>

#### **2. Hands-on experimentation with the HARMONIE data assimilation**

Led by Xiaohua and with strong and enthusiastic support from Alena Trojakova and Vincent Guidard, it was made possible for the participants to carry out pioneering experimentation with the HARMONIE data assimilation system. During this experimentation several deficiencies in the software were detected and corrected for. In other words, a very useful and funny exercise!

Instructions to carry out experiments at HPCE are available at the site given above!

### **3. Planning of the validation/development of the HARMONIE data assimilation, including 3D-Var and CANARI, and comparison with HIRLAM 3D-Var**

**Phase I:** Plan of actions with the main goal to have a basic system ready for pre-operational test in the HIRLAM member countries by 1 January 2009:

(a) Evaluate and improve the basic surface assimilation (CANARI).

Maria will continue to check, and if needed modify, the 2 meter temperature and 2 meter relative humidity analysis scheme and also the soil temperature and soil moisture assimilation schemes. (Maria, deadline 1 July)

Mariken will do the same for the SST assimilation and she will also check how sea ice is handled (or not handled) in HARMONIE. As a first basic solution we should extract SST and sea ice from ECMWF or HIRLAM RCR. (Mariken, deadline 1 July)

(b) Cycling of cloud water and other physical variables in the HARMONIE data assimilation.

As a first step (the Meteo-France fix) the BLENDING software will be introduced as a separate step after 3D-Var to restore at least cloud water from the background state. (Ulf, deadline 1 July). As a final solution, the 3D-Var should be modified to take care of this task in a proper way. (Magnus, deadline 1 December)

(c) Examine the observation error standard deviations that are used in HARMONIE 3D-Var and compare these with the corresponding standard deviations in HIRLAM 3D-Var. (Magnus, deadline 1 July)

(d) Introduce a observation data usage monitoring system and couple it to the HARMONIE as well the HIRLAM data assimilation, possibly during a dedicated working week. The system developed by Roger utilizing the odbviewer is one obvious candidate for this task, but the possibility to utilize also the ECMWF OBSSTAT system should also be investigated. (Roger, Ole, Ulf, Xiaohua, deadline 1 October)

(e) Run single observation experiments to check the HARMONIE assimilation structure functions and run randomization experiments to check background error statistics in observation space. (Carlos, deadline 1 October)

(f) Run a week with cycling and conventional observations with the HARMONIE 3D-Var/CANARI and the HIRLAM 3D-Var/SPAN. Monitoring of the use and quality control of observations with the tools mentioned above; carefully checking the assimilated model fields and assimilation increments; monitoring of the data usage; checking of data rejections; calculating forecast verification scores etc. (Magnus to do the assimilation runs before the end of August; Maria, Mariken, Carlos, Roger and Sigurdur to carry out the monitoring and validation work, guided and coordinated by Magnus, deadline 1 November)

(g) After the validation of the one week assimilation run with HARMONIE and comparison with HIRLAM have been done, and actions to remedy likely errors and weaknesses, a one month parallel experiment with conventional observations only (HARMONIE and HIRLAM) will be carried out.

(Same responsible person as above, deadline 15 November for the run and 15 december for the monitoring and validation)

(h) Development of a tool to be able utilize structure functions from one particular model domain also to other model domains. The available tool developed by Loik Berre to change the resolution of an existing structure function file could be used as a starting point (Nils, deadline 1 October)

(i) Reporting on the status of the HARMONIE data assimilation and its readiness for use in pre-operational runs by the HIRLAM member institutes. (Magnus and the team members in contact with Nils, deadline 1 January 2009)

(j) ODB training and implementation + documentation: A pilot installation will be made at SMHI in June 2008 with support from ALADIN experts. This will be followed by a training week on ODB installation and usage for HIRLAM participants in September (responsibility of the system group).

**Phase II:** Further testing of the HARMONIE data assimilation and comparisons with HIRLAM data assimilation – to be planned in more detail during autumn 2008:

- Extended parallel experiments with the HARMONIE and HIRLAM data assimilation systems, utilizing also satellite and remote sensing data (early 2009).
- Introduce the possibility to have a wider extension zone in the background error constraint calculations and in the assimilation control vector. This is not a necessary task for the basic version of the HARMONIE data assimilation based on 3D-Var, since different extension zones can be applied in the 3D-Var assimilation and in the forecast model, interfaced via a FULLPOS or GL conversion. It becomes an important task for HARMONIE 4D-Var. (Nils with support from Claude Fischer and others, deadline 1 March 2009) utilizing also satellite and remote sensing data (early 2009).
- Testing the HARMONIE data assimilation also at mesoscale resolutions (early 2009)
- Testing and comparing HARMONIE and HIRLAM 4D-Var (late 2009)