

Minutes from the working week on HARMONIE surface and soil data assimilation met.no 9-13 November 2009

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Workshop objective:

To install, test and validate surface and soil data assimilation for HARMONIE in the case that SURFEX is applied in the forecast model. A 3-step development strategy was envisaged for this work: (1) Simple cycling of the soil variables (AN=FG); (2) OI for the soil variables (i.e. the executable OI-main should be applied); (3) Simplified EKF for the soil variables (i.e. the executables Offline/Varassim should be applied).

Main achievement and main problem:

We managed to construct and implement the scripts, including all needed file-communications, and the SMS-tasks that incorporates the executables OI-main and Varassim into the HARMONIE system. With regard to the source codes, however, we found that the SURFEX source codes in HARMONIE need to be upgraded to version 4.8 from the present version 4.4 to be able to apply the soil assimilation modules. There are huge differences between these two version of SURFEX, 612 files differ between the two versions and 368 new files have been added in version 4.8.

After a discussion it was agreed that we should wait for the release of the ARPEGE cycle 36t1, that is presently being "phased", for further online tests. In the mean time the developed HARMONIE scripts can be used for tests together with the export version of SURFEX. The cycle 36t1 release includes SURFEX 5.1. A stable HARMONIE 36h1 is likely to be available by March 2010.

Further problems noticed and partly resolved:

A call to a task ADDSURF is presently needed in order to copy some surface climate fields into the FA-file that is read by CANARI. It is not clear, however, whether these climate files are really needed by CANARI, in case soil assimilation is done by OI-main or Varassim. This needs to be investigated (Mariken and Maria, deadline 1 January 2010).

The forecast with SURFEX, which produces the first guess for the OI_MAIN, has a mismatch in time from the file used for atmospheric forcing. This mismatch of one time step causes the forecast to abort. The matter is reported to Meteo-France for consultancy on how they have solved it. Trygve takes care of any further action needed (deadline 1 January 2010).

Steps (or tasks) in the further development of surface and soil assimilation based on SURFEX:

1. Continue testing and validation of soil assimilation with OI-main and Varassim in off-line mode. (Maria (Mediterranean conditions) and Mariken (Nordic conditions), "Health" tests, with priority for OI-main, before the next working week).
2. Define exactly which version(s) of SURFEX to be applied together with soil assimilation in HARMONIE, as well as in the corresponding forecast model. Probably there are two such versions: (a) the "AROME-like" version that will be applied operationally in ALADIN-Meteo-France and (b) the AROME version. We need to communicate with Meteo-France on this issue (Maria is responsible, this

- information is needed to carry out the tests mentioned above).
3. Implement ARPEGE 36T1 into the HARMONIE framework (Ulf and Ole, "wished" ready time for testing assimilation January 2010).
 4. Investigate what is needed to implement SURFEX also for the ALARO physics option in cycle 36T1. If possible, do this implementation as a preparation for the next surface and soil assimilation working week. (Ulf, before the next working week)
 5. Would be interesting begin to work with SURFEX OFF-LINE v5.1 (Maria and Mariken, before the next working week).
 6. Jean-Francois Mahfouf to be contacted about the tiled version (AROME) of the assimilation software (Toon, before next working week).
 7. A new surface and soil assimilation working week to complete the work started during the present working week. (We aim for 15-19 March at met.no, this document is the preparation plan).
 8. We will establish a monthly running status report (Nils will send out a reminder, Nils and Mariken will produce the report at the end of each month).
 9. Toon will do a quick test to see whether this chain of tasks could be accelerated by using a newer required version of SURFEX already with the trunk of HARMONIE.

Some further remarks on surface and soil assimilation for HARMONIE

The further work on surface and soil assimilation in HARMONIE will follow the HIRLAM work plan for 2010 that is being established at present. The working group participants would like to express the following particular views, in addition:

The initial SST and sea ice fields are presently obtained by interpolation from ECMWF fields, replacing the climate fields (carried out within the CANARI module). The possibility to carry out an analysis is still possible with CANARI, provided the needed observations can be inserted into ODB (in BUFR format). It is considered that this option could be needed in the future for high resolution (km-scale) applications. Also an updating of the sea-fraction initial field from, for example, high resolution OSI/SAF products, will be probably be needed in the future (also to be carried out in CANARI).

In order to transfer any surface and soil fields all the way to SURFEX in the model, any fields that are updated in CANARI, need also be communicated to SURFEX via OI-main/varassim. One may also consider to introduce the ECMWF SST and sea ice fields in a step after CANARI.

The working week would like to alert the HIRLAM Management Group on the need for a more modern 2D spatialization tool than the current CANARI. Even SPAN would be an improvement, SPAN could be made parallel quite easily (in the way it was done for the old HIRLAM OI). A more up-to-date spatialization could be based on variational techniques applying wavelets to describe inhomogeneities and an-isotropy. The important thing is to give a dedicated team enough time to do it!

Simplified cycling of surface variables will be tried at KNMI (refreshment of the forcing from HIRLAM on the lateral boundaries only) and at met.no (refreshment of the upper-air fields also inside the domain from ECMWF fields and later on by 3D-Var). These "cycling" options will be included in the HARMONIE system.