



## ACCORD visit: Overview and Outcome

**Time:** 18.10.2021 – 5.11.2021

**Location:** Norwegian Meteorological Institute (Oslo)

**Visitor:** Alina Lerner, ESTEA (Estonia)

**Hosts:** Roger Randriamampianina and Per Dahlgren, Met.no (Norway)

### Background

The purpose of this visit was to gain the fundamental knowledge about the data assimilation processes in Harmonie system. There are no experience in Estonia in overall data assimilation and especially in the Harmonie code development. Thus, the visit to MET Norway was crucial for ESTEA to start growing the expertise in DA, which is important to support ESTEA's future contribution to the ACCORD work.

### Objectives

- Learn the full Harmonie system from observation pre-processing up to observation monitoring and DA diagnostic;
- Learn the computation of background error statistics for the new domain.

### Deliverables

- Experiment setup for background statistics calculation;
- B-matrix test-files for HMEST25 domain.

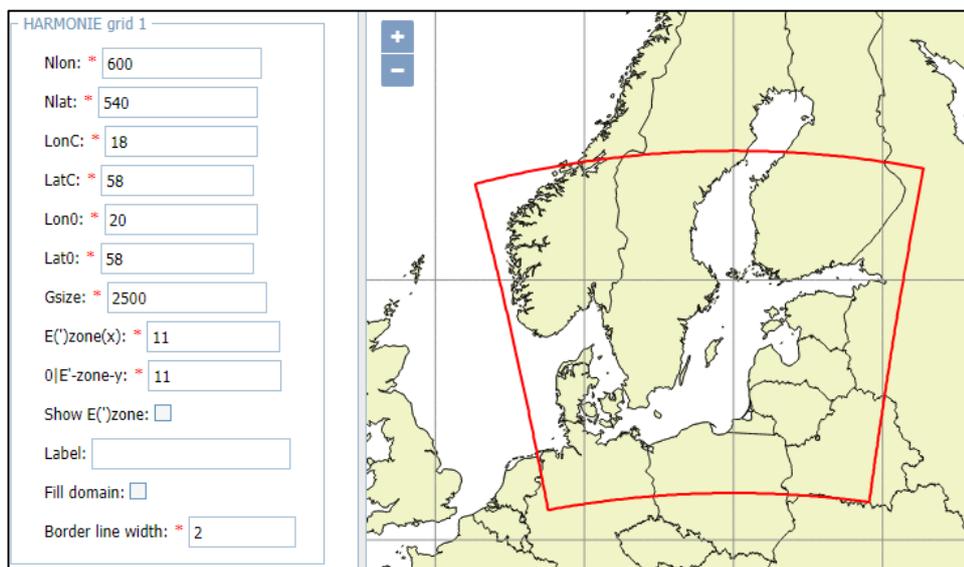


Fig. 1 Definition of the HMEST25 computational domain

## Description of the visit

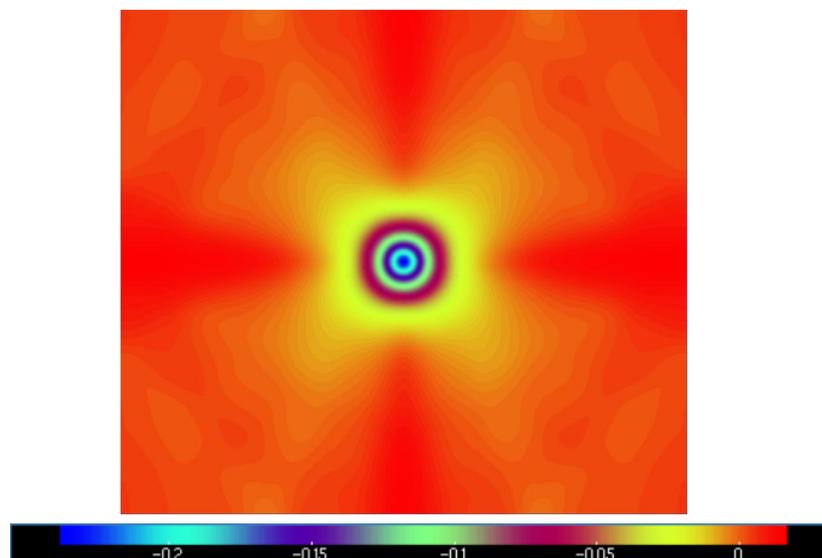
Roger Randriamampianina and Per Dahlgren supervised me during the all three weeks at MET Norway. The material from Aladin/LACE and Hirlam Budapest training (2019) was taken as the basement for learning the Harmonie system and data assimilation during the visit. The exercises with Bator and Screening have been done, OBSMON and jbdiaconv were tested. In parallel to learning the training course material and theoretical reading, we tried to perform the background error statistics calculation using downscaling for the new domain HMEST25 defined by ESTEA (see Figure 1).

## Outcomes

By the end of the visit I could understand the composition and cycling of Harmonie system. I was taught how to set up experiments, fetch and alter the namelists. I can find the input/output/archive and log files, in case of experiment crash I am more likely to find the reason and eliminate it (in some easier cases). I know how to use eflow efficiently – suspend, rerun, set complete, find the output of the task etc.

The derivation of the background error statistics for the HMEST25 domain has been based on data generated with ensemble HARMONIE forecasts, which downscale from ECMWF EPS runs. In order to save the time of the visit the structure functions were obtained from 10 days forecasts (01.12.2020 00Z to 10.12.2020 18Z).

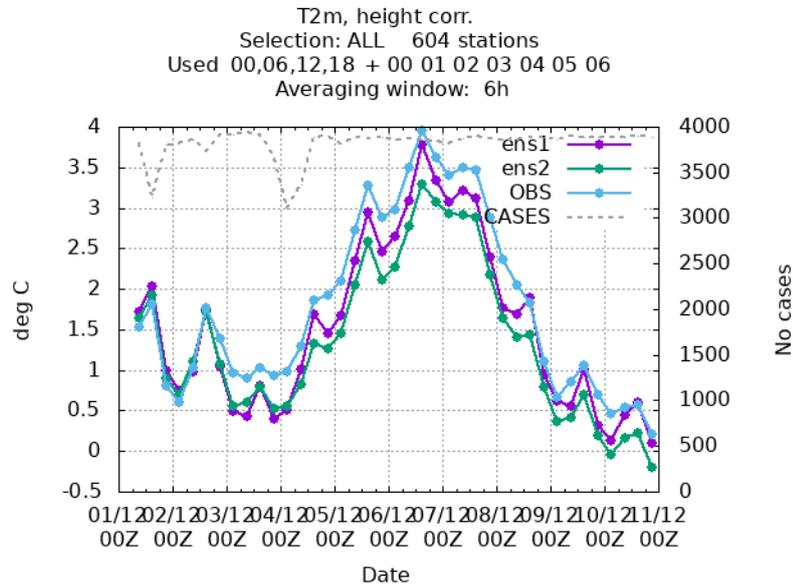
The single observation experiment run successfully when the calculated B-matrix was incorporated. The graph presented in Figure 2 shows the increments (differences between the first guess and analysis) of the temperature field at the 24<sup>th</sup> model level. The single temperature observation, which was 2 K higher than the first guess, got assimilated.



*Fig. 2 Assimilation of the single temperature observation - analysis increments at 24<sup>th</sup> model level*

The Figure 3 demonstrates the results of the verification of the 1<sup>st</sup> ensemble member forecast produced using the generated structure functions (ens2) and without it (ens1). In this case, using the structure functions decreased the quality of 2 m temperature forecast. However, it is not the point of the work. The result could be foreseen, as the B-matrix was not calculated

properly. It was the exercise to go through all the computation and verification steps. Thus, the result is satisfactory.



**Fig. 3** Verification of 2 m temperature produced by 1st ensemble member forecast with no upper atmosphere analysis (ens1) and produced using the 3DVAR analysis (ens2)

### Foreseen next steps

The experiments with B-matrix computation are going to be properly done. Either one summer and one winter month forecasts or one month forecast from every season will be used to make the calculations in order to sample seasonal variation as well.

As the continuation, the next visit to the Met Norway has been agreed with Roger Randriamampianina. It will be dedicated to setting up a high-resolution NWP system with DA, including uncertainty estimation and exploration of high-resolution observations and quality control.

### Acknowledgements

I acknowledge the ACCORD consortium for giving the opportunity to make the visit to the Met Norway. I thank the host Roger Randriamampianina for organizing the working conditions and supervising me through the process. I also would like to thank Per Dahlgren for helping me out with Harmonie system and eliminating numerous errors.