HIRLAM activities: an overview

Jeanette Onvlee

EWGLAM meeting, Reading, 02/10/2017

Organization

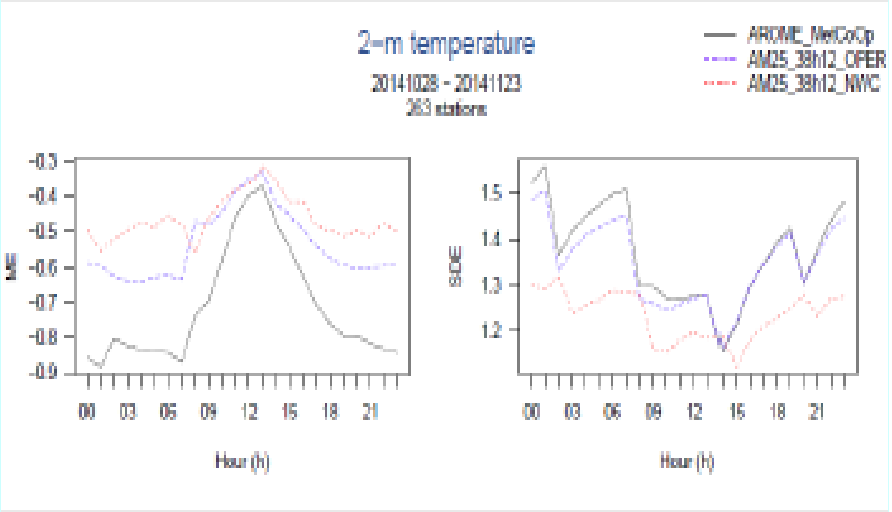
- **Members unchanged: Dk, Es, Fi, (Fr), Ic, Ir, Li, Ne, No, Sp, Sw**

- **Management group:**
  - ✓ **Programme manager: Jeanette Onvlee**
  - ✓ **PL Data assimilation: Roger Randriamampianina**
  - ✓ **PL Forecast model: Lisa Bengtsson => Sander Tijm**
  - ✓ **PL Surface analysis and modelling: Patrick Samuelsson**
  - ✓ **PL Probabilistic forecasting: Inger-Lise Frogner**
  - ✓ **PL Quality assurance: Bent Hansen Sass**
  - ✓ **PL System: Daniel Santos Munoz**
  - ✓ **Scientific secretary: Frank Lantsheer**

Data assimilation and use of observations

Methods

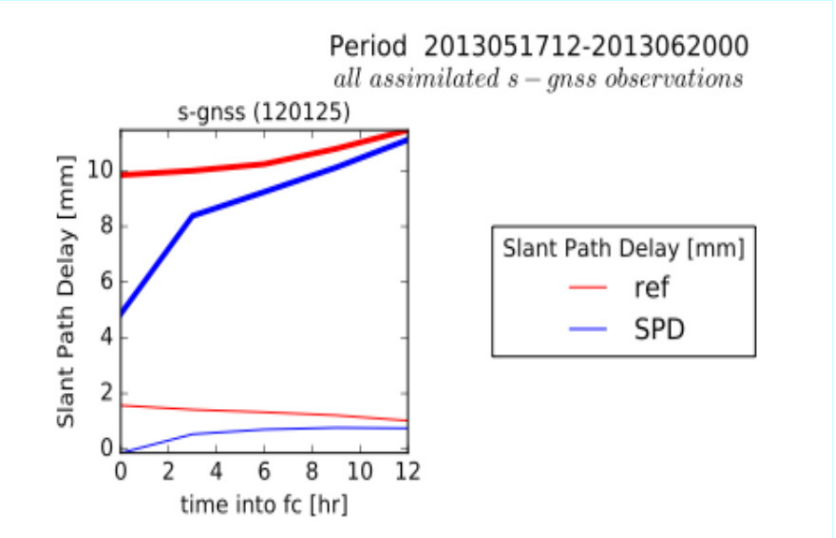
- ✓ **3D-Var: testing various B-matrix formulations, large scale treatment, balances**
- ✓ **4D-Var: extending with non-conventional observations**
- ✓ **Optimize 3D-Var in nowcasting range**
  - ✓ **Cycling strategies**
  - ✓ **Combination with satellite imagery, radar data: cloud initialization and field alignment techniques.**



1h rapid refresh setup at MetCoop, 15m cutoff time

Observations:

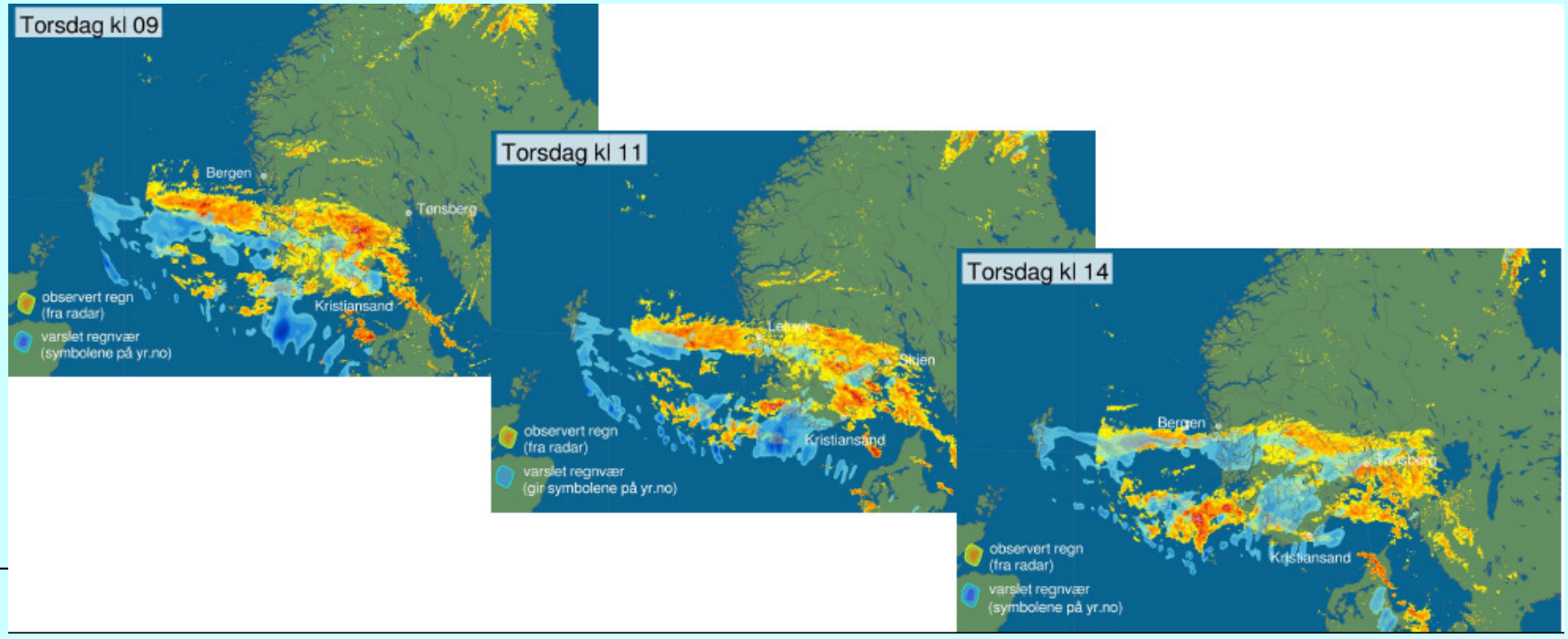
- ✓ **Continue to enlarge range of non-conventional observations in operational suites: AMSU-A/B, ATMS, MHS, IASI, SEVIRI radiances; radar reflectivity and wind; GNSS ZTD; Mode-S; AMV; scatterometers; GPS-RO**
- ✓ **New data sources:**
  - ✓ **GNSS slant delay assessment, VarBC**
  - ✓ **Preparations for assimilation of all-sky radiances**
  - ✓ **Non-NMS observations (hot air balloons, smart phones)**



Forecast model

- ✓ Attempts to improve winter T2m and convection/turbulence
  - multiple patch experiments (in model and in validation).
  - problems seen in triggering of severe convective events (too little, too late)

- ✓ Radiation/clouds/aerosol interaction
  - harmonization of treatment in radiation/cloud/convection
  - study of indirect aerosol effects, and introducing daily observed aerosol and aerosol parametrizations

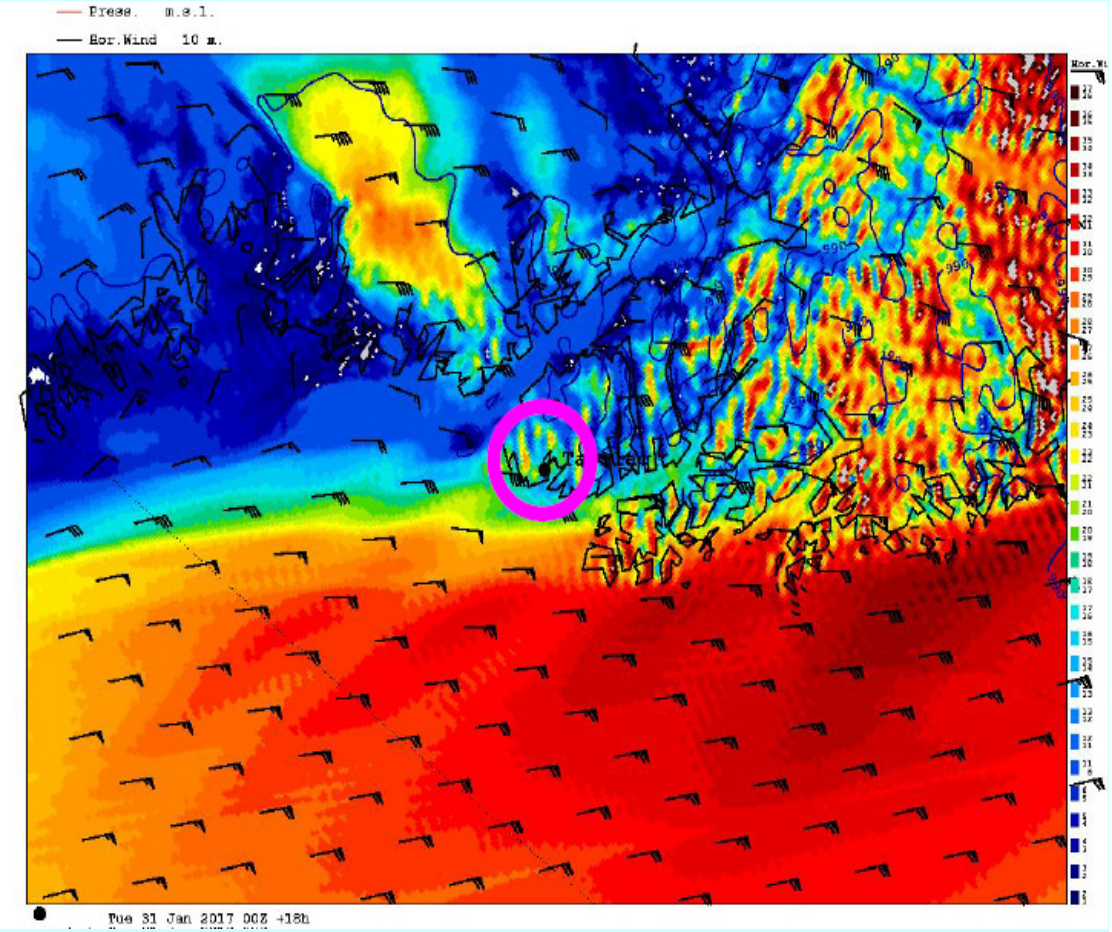


Towards higher resolution

Aims:

- **Make and test configuration for operational resolution increase (optimal balance resolution, domain size, ensemble size, …)**
- **Research at hm resolution**

- **Sub-km modelling and cycling on different domains (incl LES)**
- **Test domains (“continental”, “maritime”) for specific aspects, e.g. urban representation, land-sea transitions, satellite DA in data-sparse area, orography**
- **Multi-disciplinary: dynamics, parametrizations, surface aspects, DA, verification, computational efficiency, EPS**



Tassilaq 750m domain: Realistic winds in view of local orography. Presently some ~8 domains <1km, including DA setups

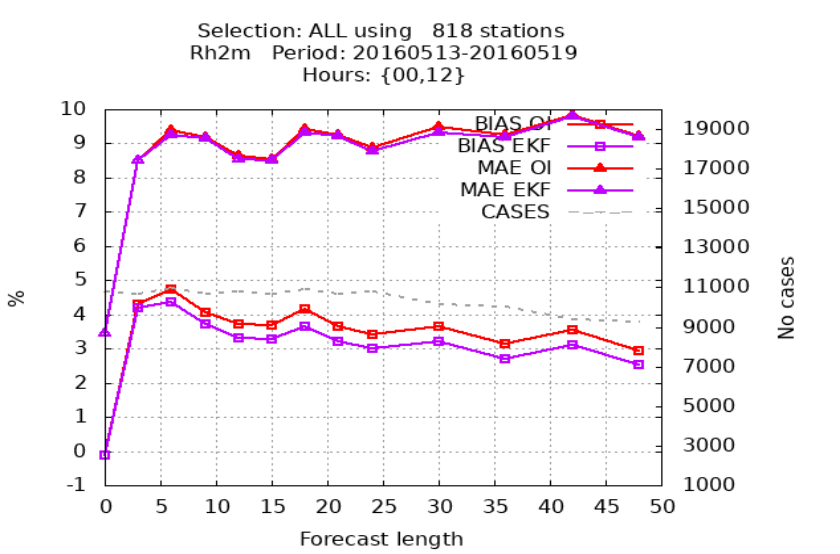
Surface analysis and modelling

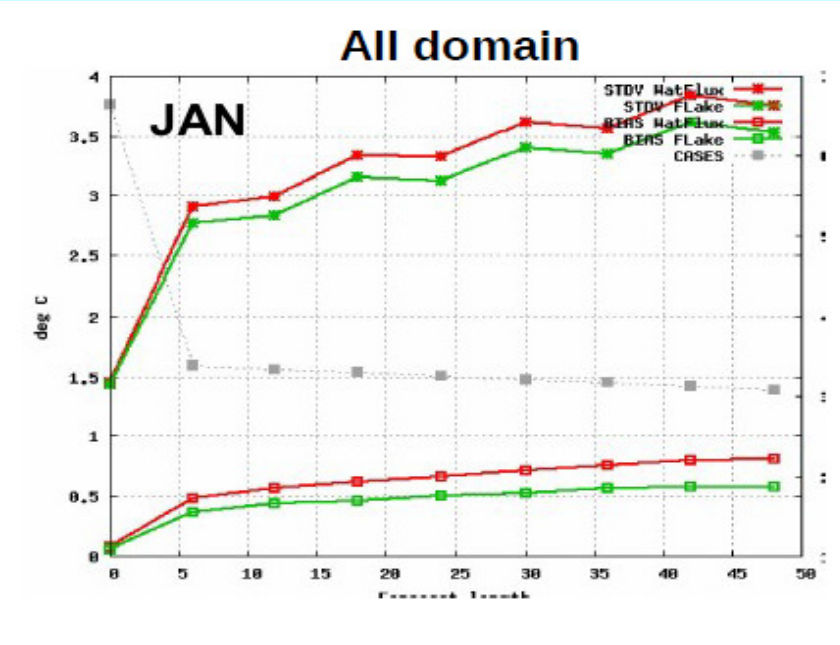
Key aims:

- Improve surface analysis with more satellite observations, more advanced assimilation algorithms
- More advanced surface parametrizations for soil, snow, sea ice, lakes, in combination with surface assimilation

Activities:

- (S)EKF to replace OI, improvements in horizontal spatialization
- ASCAT soil moisture, snow assimilation
- Upgrade SICE
- Flake preparation for operations, DA
- Prepare for testing Surfex-v8 (DIF,ES,MEB)
- Identify/tackle weaknesses in physiography





Probabilistic forecasting

HarmonEPS

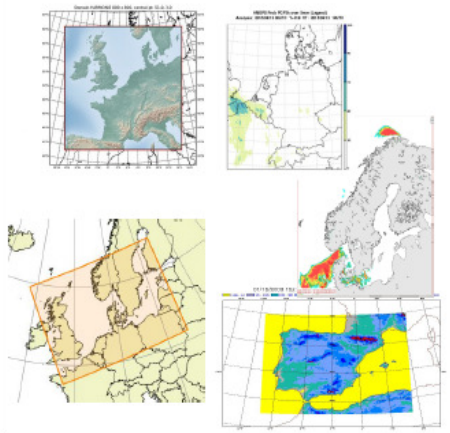
Operationalization ongoing in several institutes

MEPS (MetCoOp EPS) was operational on 8. November 2016 - see presentation by U. Andrae

Configurations vary, but typically between 10+1 and 20+1 members
- Arome (Alaro, not available cy40 with SURFEX)
- 2.5 km
- 3D-Var
- SURFEX
- ~48h

Nested in IFS ENS or IFS high res (SLAF).

Experiments with perturbations in initial conditions, lateral boundary conditions, model physics and surface ongoing (see talk by A. Singleton).



✓Convection-permitting HarmonEPS entering local operations: MEPS, COMEPS, gSREPS, …

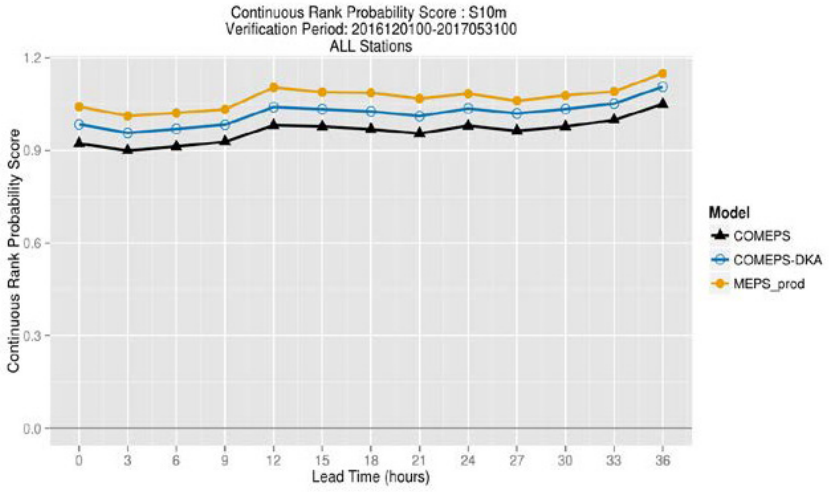
✓Different perturbation and DA/cycling setups =>possibility to learn from each other, challenge to determine optimal combination!

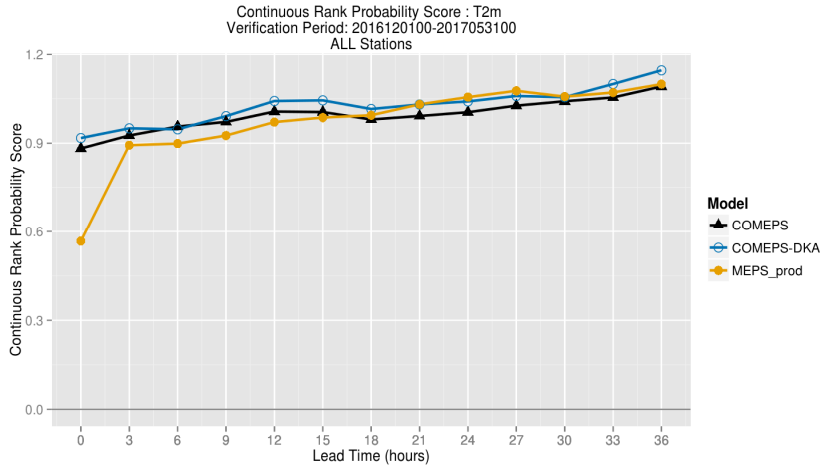
✓ Physics: experimenting with SPPT, SPP approaches and pattern generators. Surface field perturbations. LETKF, overlapping windows

✓Improving spatially varying calibration

✓How to reduce computational costs and make the most of available computer capacity? (e.g. cubic grid, single vs double precision)

✓GLAMEPS operations likely to be discontinued in 2019.





Operational cooperation

In 2017:

- FMI joining MetNorway and SMHI in MetCoop
- DMI/IMO joint production, Greenland-Iceland domains

Future extensions ?? Much interest but many aspects to be settled