

MetCoOp EPS

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What is MetCoOp?

MetCoOp is the cooperation around NWP production between Sweden and Norway. It was established in 2011 and has been running HARMONIE operationally since March 2014. The shared tasks involves pre processing of observations and boundaries, the core production and the daily monitoring of the meteorological and technical performance. Post processing and product generation is handled by each institute. Since the fall of 2016 work is ongoing to integrate FMI in MetCoOp with the aim to have them as a part of the production in mid 2017.



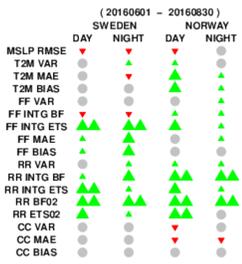
The MEPS setup

- Based on harmonie-40h1.1 using HARMONIE-AROME with 750x960 points, 2.5km grid spacing, 65 levels
- Control members run 3DVAR with large scale mixing every 3h. Observations used are: conventional observations, AMSU A/B, MHS, IASI, ASCAT, RADAR and GNSS
- All members runs surface assimilation every 6h with using T2M, RH2M, ECMWF+HIROMB (oceanographic model) SST/SICE
- Control and perturbed members runs up to 66h and 36h respectively every 6h.

- Ten members runs distributed over two clusters so that one cluster will serve as a backup for the other.
- **Frost:** 1 arome control, 5 perturbed arome members
- **Vilje:** 1 arome semi-control, 3 perturbed arome members
- The SLAF method is used to produce initial and boundary perturbations.

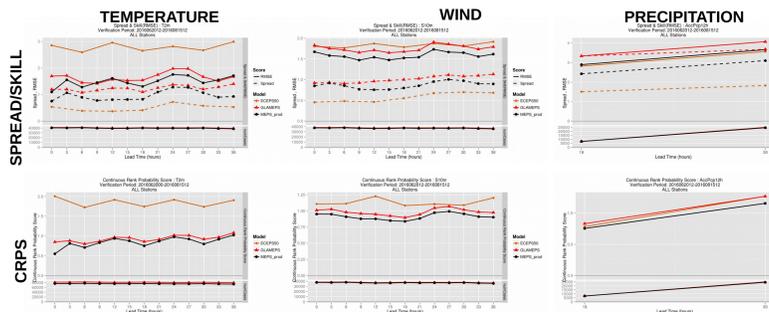
Quality of HARMONIE 40h1.1

SCORECARD AROME CY40h1.1 vs ECMWF



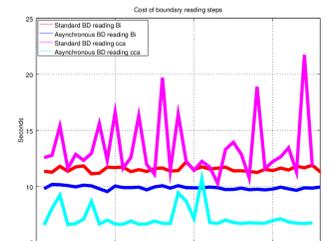
MEPS replaces the current 38h1.2 version. Improvements such a reduced positive wind bias and less excessive fog and precipitation can be noted. The scorecard above shows a maintained improvement over ECMWF over areas of importance.

MEPS performance for the summer of 2016



ECMWF (51)
 GLAMEPS (52)
 MEPS (10)

MEPS has been running in near operational mode since mid June and this allows us to make a comparison with other ensemble systems available for the forecasters such as ECMWF ENS and GLAMEPS. From the spread skill relationship shown above it is clear that MEPS and GLAMEPS are comparable whereas ECMWF is under dispersive. For CRPS MEPS has the smallest error although the difference to GLAMEPS is not very large. Note that both ECMWF and GLAMEPS has more than 50 members whereas MEPS has 10.



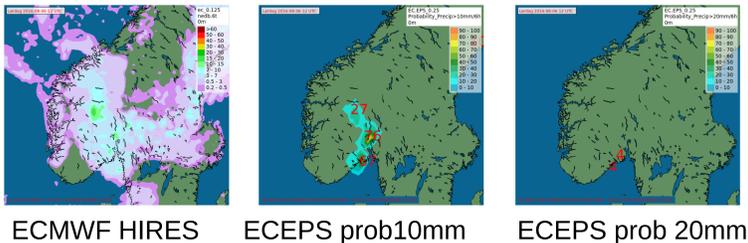
To be able to meet the operational requirements a number of improvements has been done on top of 40h1.1. The figure above shows the effect on the IO timesteps by using asynchronous reading of boundaries. The total gain in the operational setup is up to 5 min for a full run. Other improvements concerns reduced IO and OpenMP threading on e.g. GRIB conversion.

Technical challenges with MEPS

Case with flash floods around Oslo on 6th of August 2016

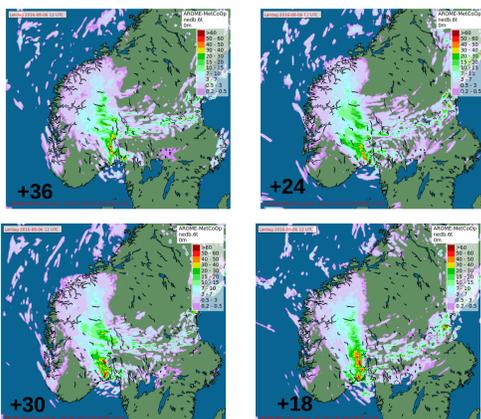
ECMWF forecast

6h acc precipitation +24h 6-12UTC



AROME-MetCoOp (38h1.2)

6h acc precipitation 6-12UTC



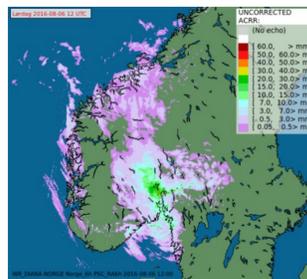
6. august 2016 kl. 11:32 Regn skaper kaos p  Ostlandet - Vgtrakkisentralen ber bilister vente med   kj re eller at kraftig regn har skapt problemer p  Ostlandet i dag. Str mvesenet har rykket ut til oversv mte k per rundt om i l de Akershus og Buskerud. Nedb ren kommer til   fortsette s over dagen.



Regnet skaper problemer p  Ostlandet

OSLO - BJ�LSEN	3,6	2,6	6,2
OSLO - SANDAKER	2,8	2,2	5
OSLO - DISEN	2,2	2	4,2
OSLO - KJ�LS�S	1,2	2,1	3,3
BJ�RNHOLT	0,4	0,7	1,1
OSLO - SOLLI Plass	30,3	6,4	36,7
OSLO - BLINDERN	6,7	2,8	9,5
OSLO - BLINDERN PLU	7,2	3,1	10,3
OSLO - BLINDERN TESTFELT	6,4	2,8	9
OSLO - BYGDYD	33,4	21,3	54,7
OSLO - BESSERUD	12,8	24,1	36,7
OSLO - LILLEAKER	21,6	13,2	34,8

2h precipitation in mm

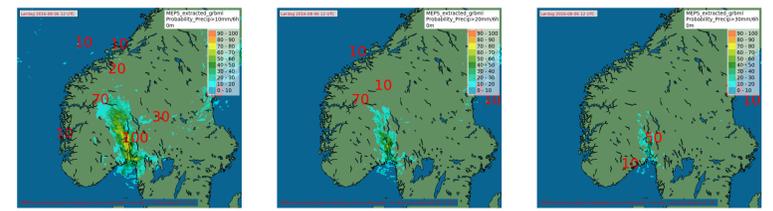


RADAR (6h acc) at 12 UTC

- Intense convective showers causing chaos in transportation and damages for around 10 million euros.
- Huge local variability within Oslo!
- The ECMWF forecast shows high probabilities for up to 10mm over 6h but nearly nothing for higher probabilities.
- Operational MetCoOp AROME underestimates and dislocates the maximum at +24h, better location and intensity at +12h.
- MEPS probabilities at +24h are in good agreement with the radar observations. Points with up to 50% probability for 30mm/6h.

MEPS (40h1.1)

6h acc precipitation +24h 6-12UTC



prob10mm

prob20mm

prob30mm

The MEPS system has been running daily in e-suite mode since June and we aim to go operational on 1st of November 2016. Future work involves :

- Increase forecast length to 48h for all members
- Further investigation of surface parameter and physics perturbations
- Revisiting the use of ECMWF EPS boundaries combined with clustering selection methods.
- Ensembles of data assimilation

For the future

For the main assimilation and forecast setup future work will involve:

- Assimilation of Danish and Finnish radars, extended list of GNSS stations and METOP-B AMSU radiances
- Testing of revised formulation of supercooled rain and snow/graupel distribution
- Divide the nature tile in high and low vegetation (2 patches)
- Use anisotropic structure functions for the surface OI scheme.

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