

AROME-Norway

From experiments to official public forecasts for the whole wide world

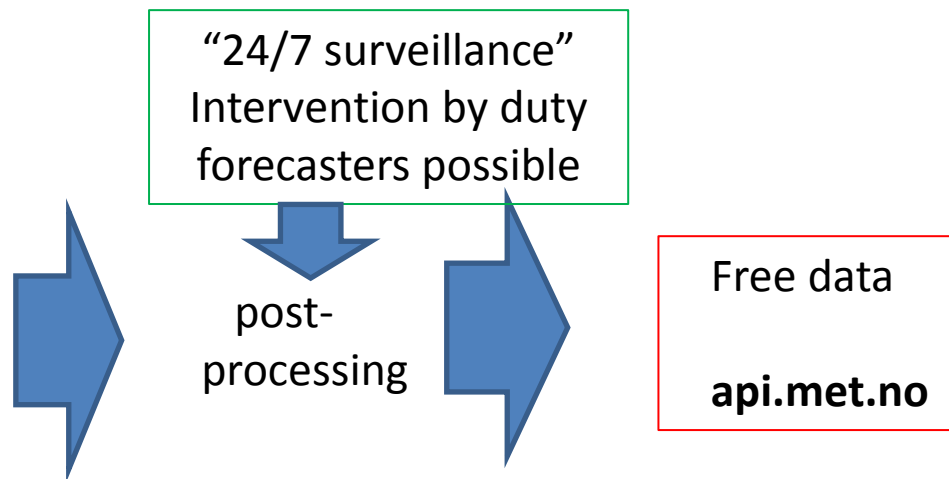
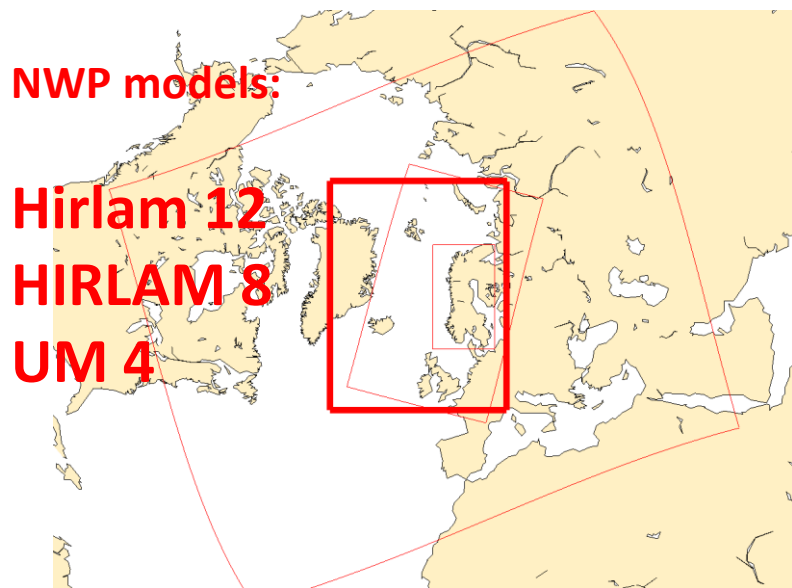
Trygve Aspelien and Morten Køltzow

and a lot of help from our friends

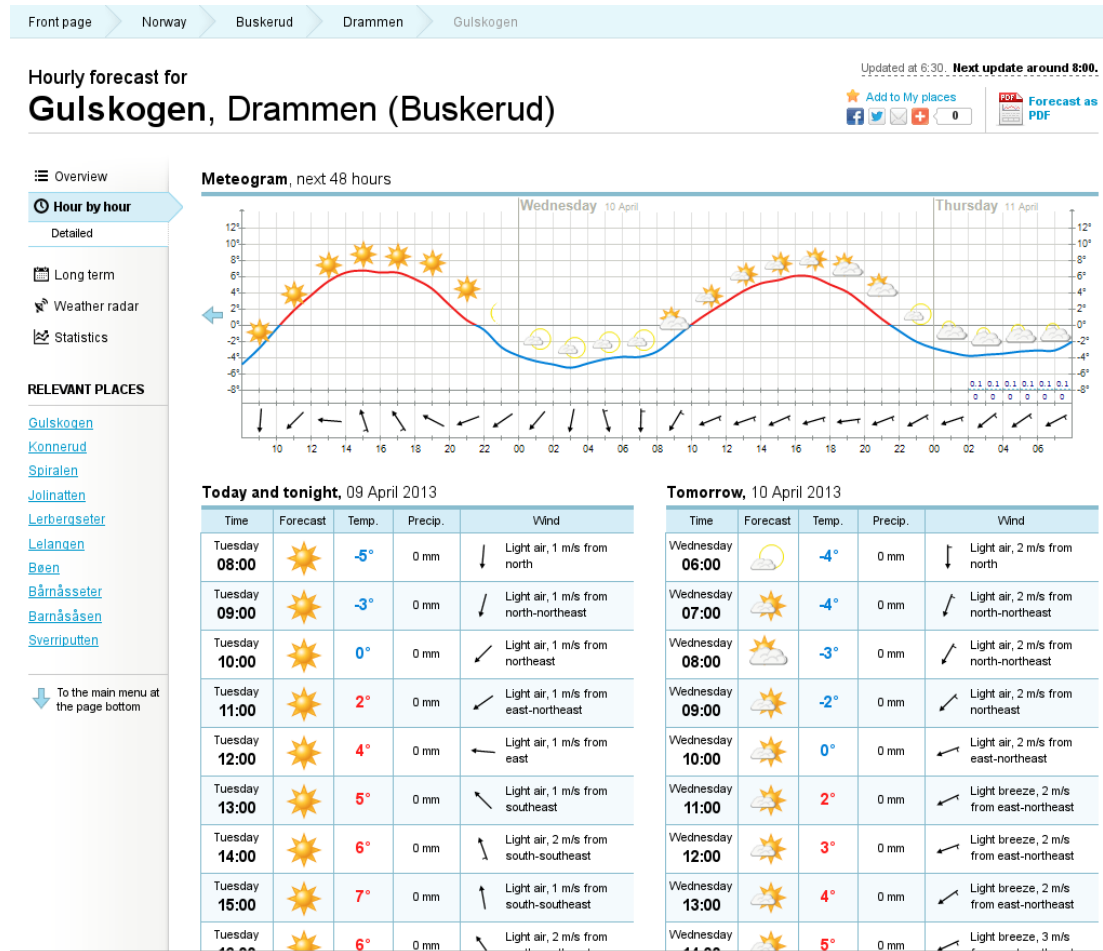
trygveasp@met.no

morteno@met.no

Production chain (today)



Example using api.met.no: www.yr.no

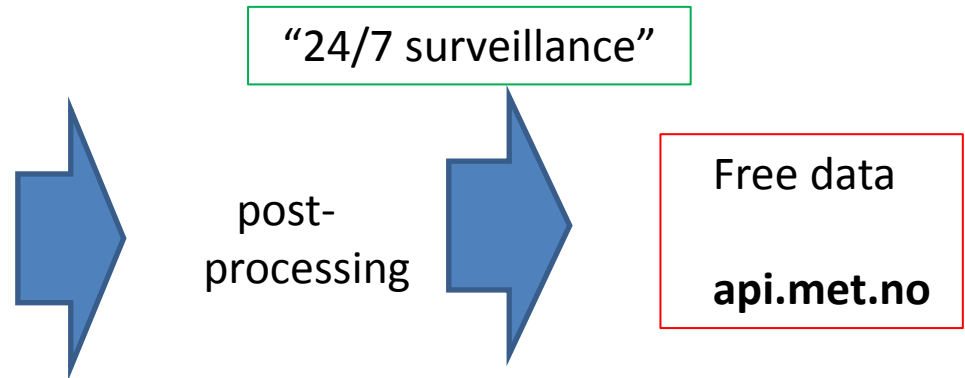
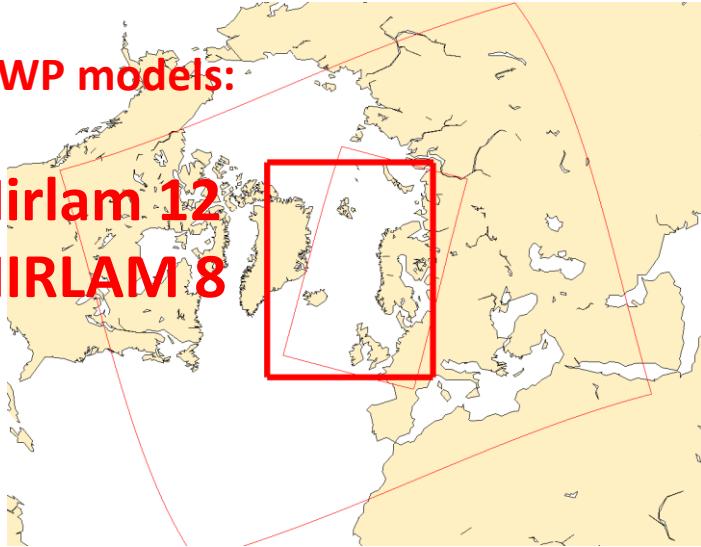


Yr.no is a collaboration between met.no and the Norwegian state broadcasting company (NRK)

New production chain(s) (Summer 2013)

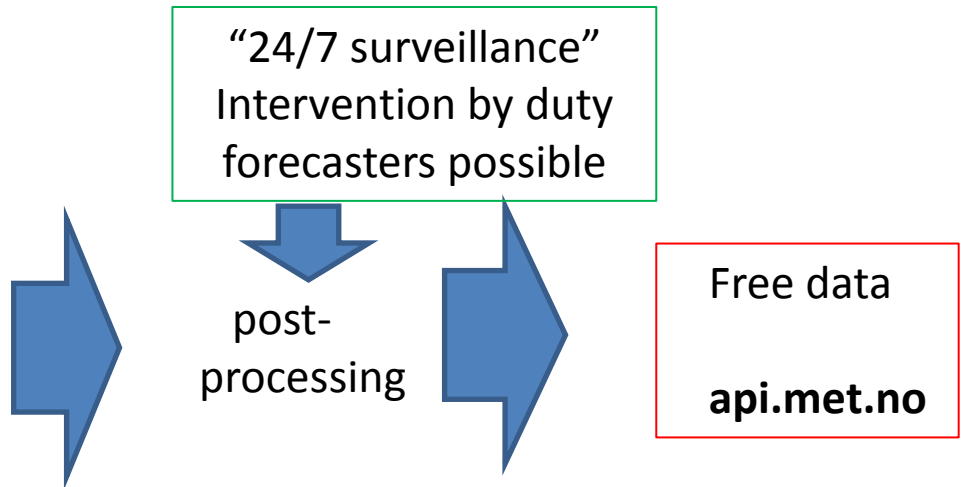
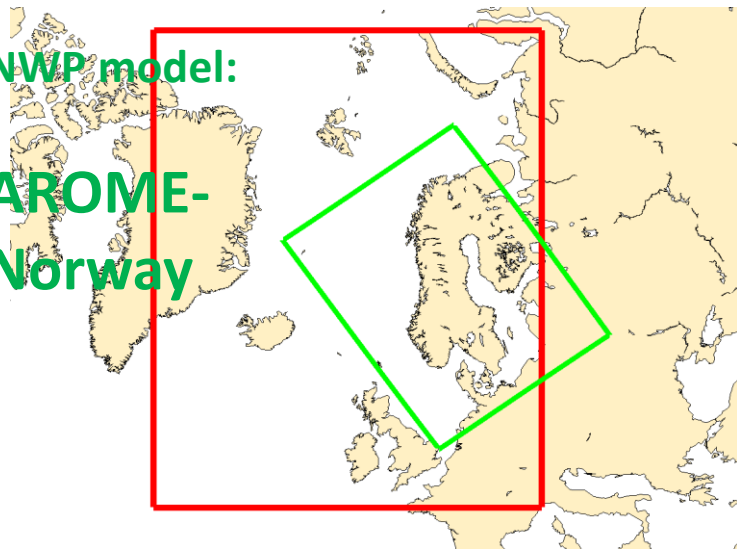
NWP models:

Hirlam 12
HIRLAM 8



NWP model:

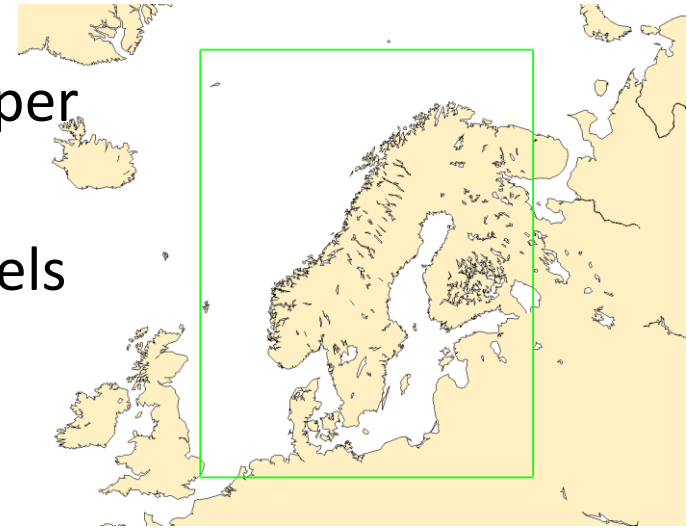
AROME-
Norway



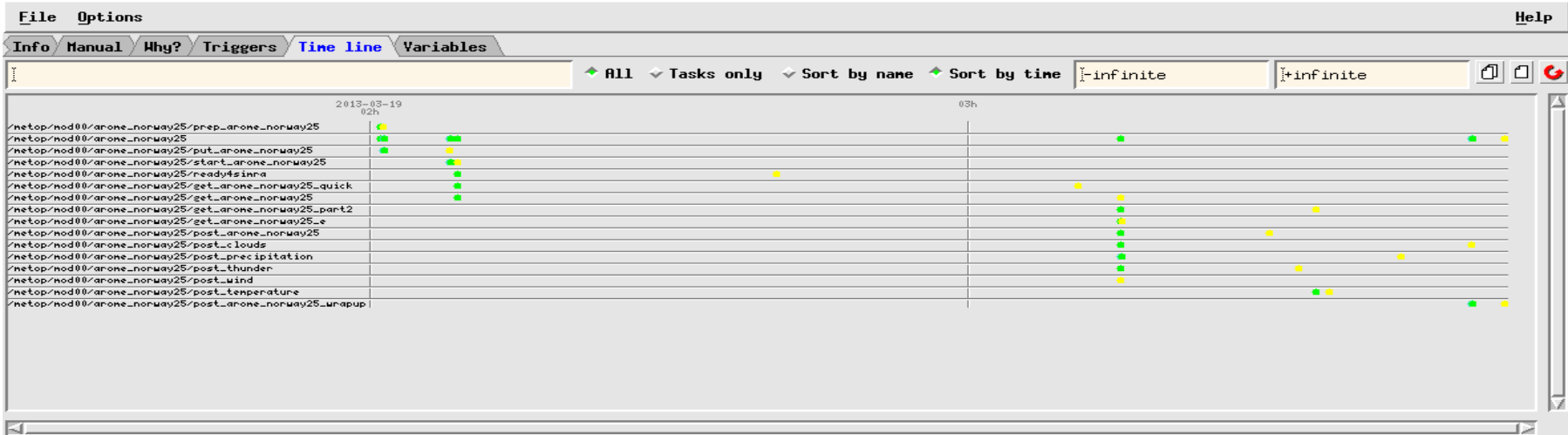
AROME-Norway

- branches/METNO/harmonie-37h1.1_oper
- AROME physical parameterization
- Resolution: 2.5 km (750 x 960) / 65 levels
- Hourly ECMWF boundaries (~16 km)
- Surface data assimilation
- Blending of ECMWF upper air fields
- +66 hour lead times
- Four cycles a day (00,06,12,18)

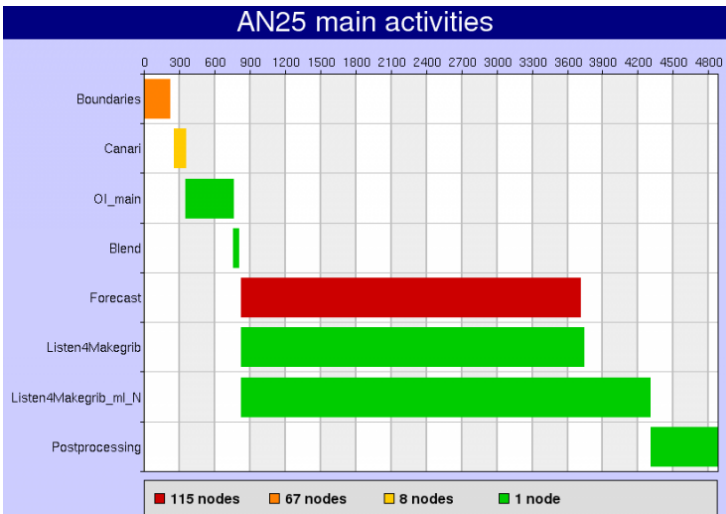
- Preparation for MetCoOp (March 2014)



Operational setup



Routine setup (model + post-processing)



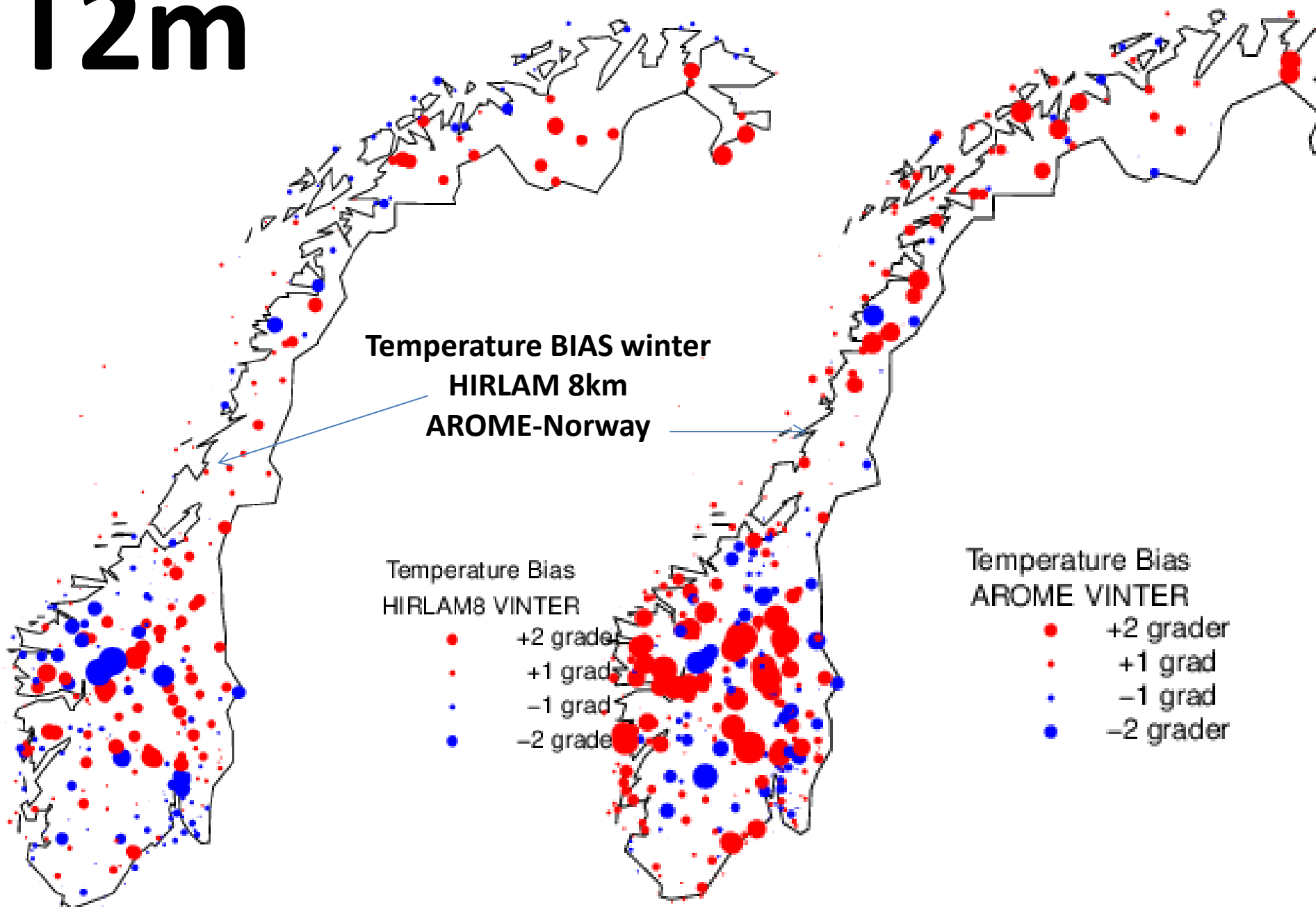
- Complex setup of AROME-Norway production.
- Some bottlenecks to be improved

HARMONIE: time usage for some tasks

Verification and diagnostics of model and post-processed forecasts:

- Near surface temperature
 - 10m wind speed
 - Precipitation
 - Clouds

T2m

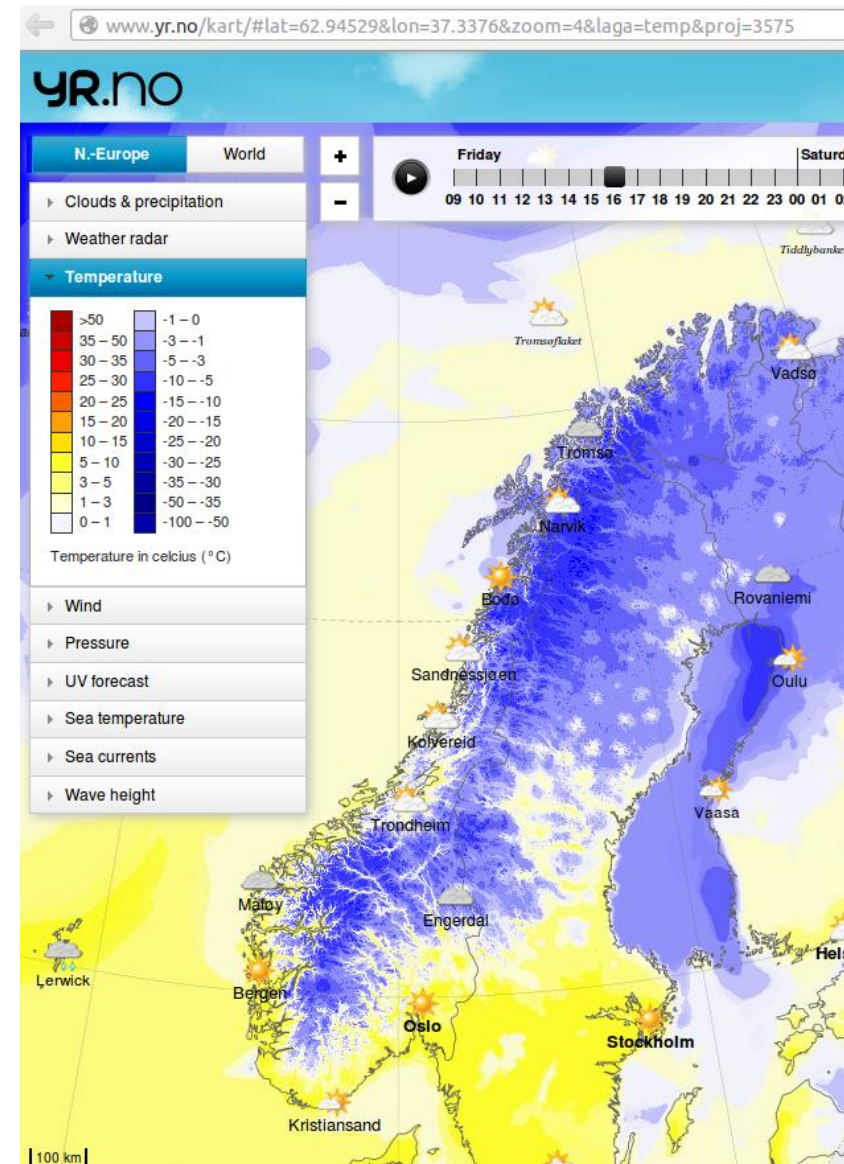
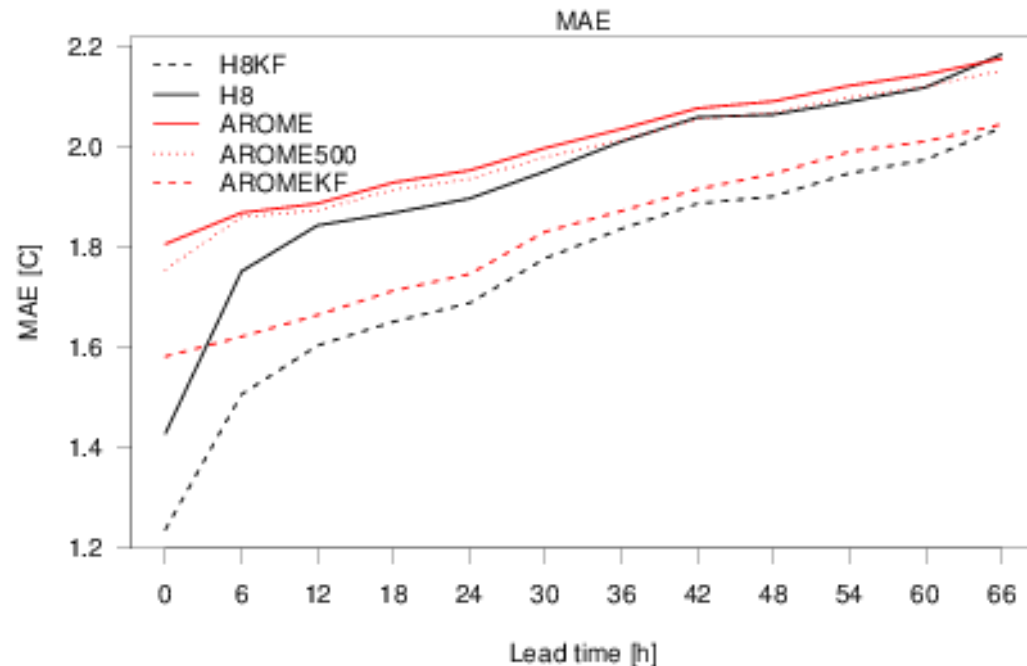


Near surface temperature (t2m):

Post-processing of AROME-Norway t2m:

Norway (and northern parts of Sweden).

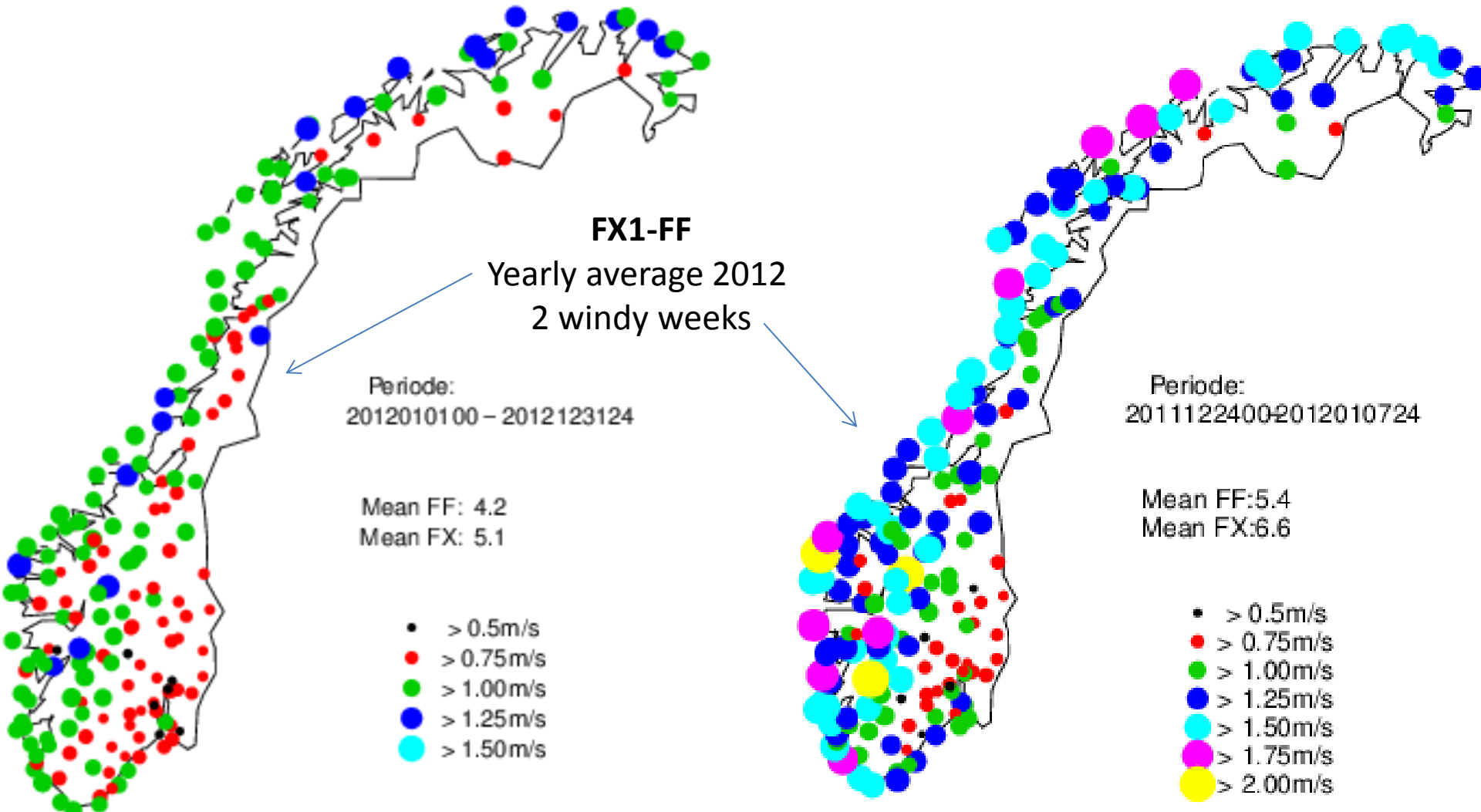
- (1) Re-gridding to 500m horizontal resolution. Simple height adjustment and an «inversion filter».
- (2) Kalman Filter correction (appr. 320 Nor. Stations). Kriging of corrections in grid ($L < 25\text{km}$, $z < 200\text{m}$).



10m wind speed – what to verify against?

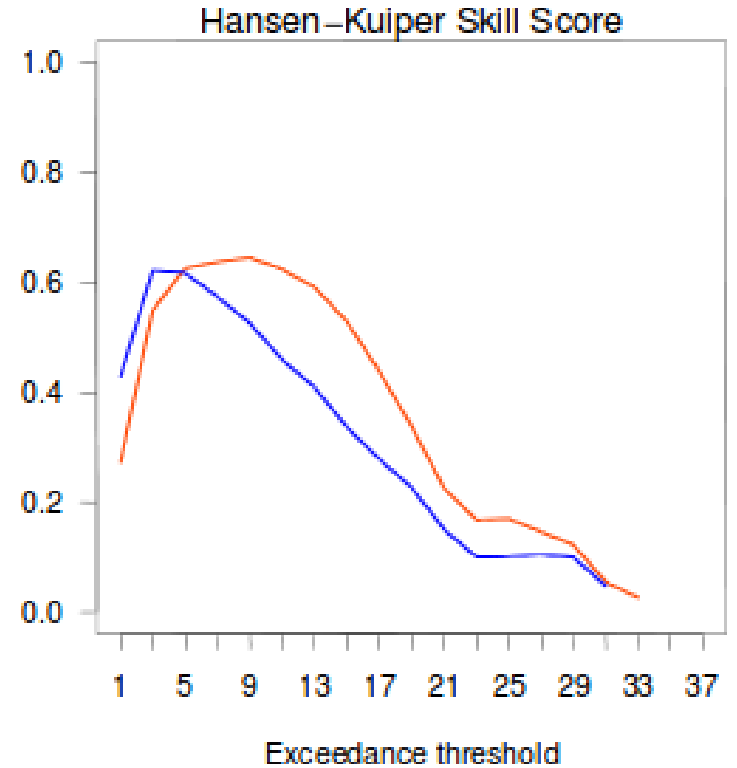
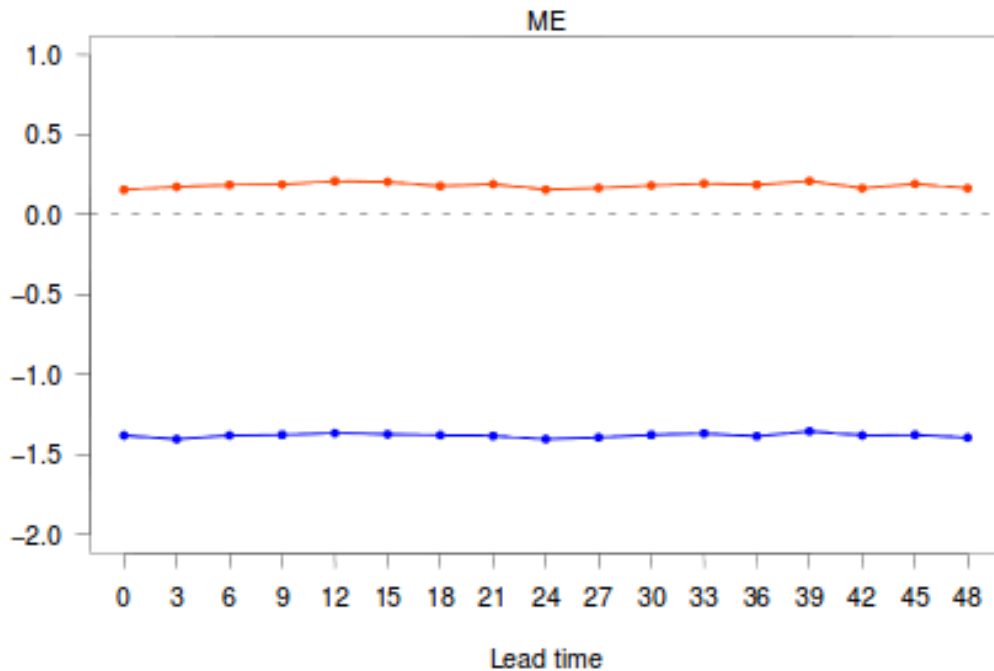
FF: 10min mean wind speed on hour?

FX1: maximum 10min mean wind speed last hour?

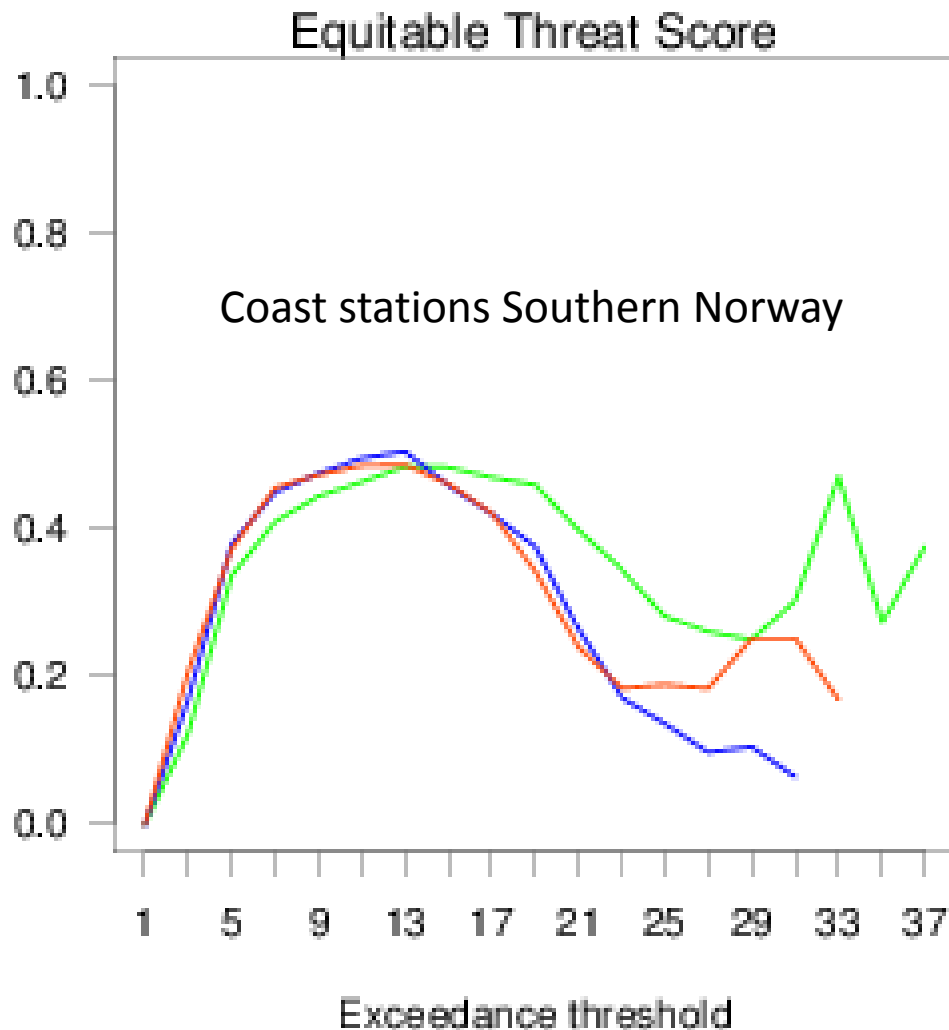


10m wind speed (FX1), BE04 vs Z01D

All Norwegian stations



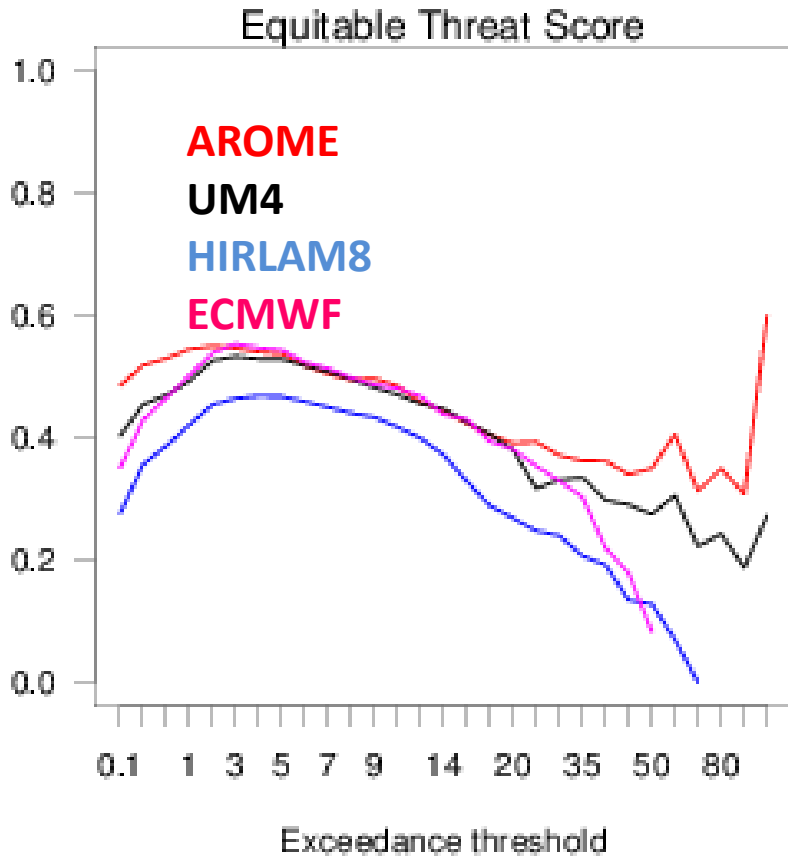
10m wind speed (FX1)



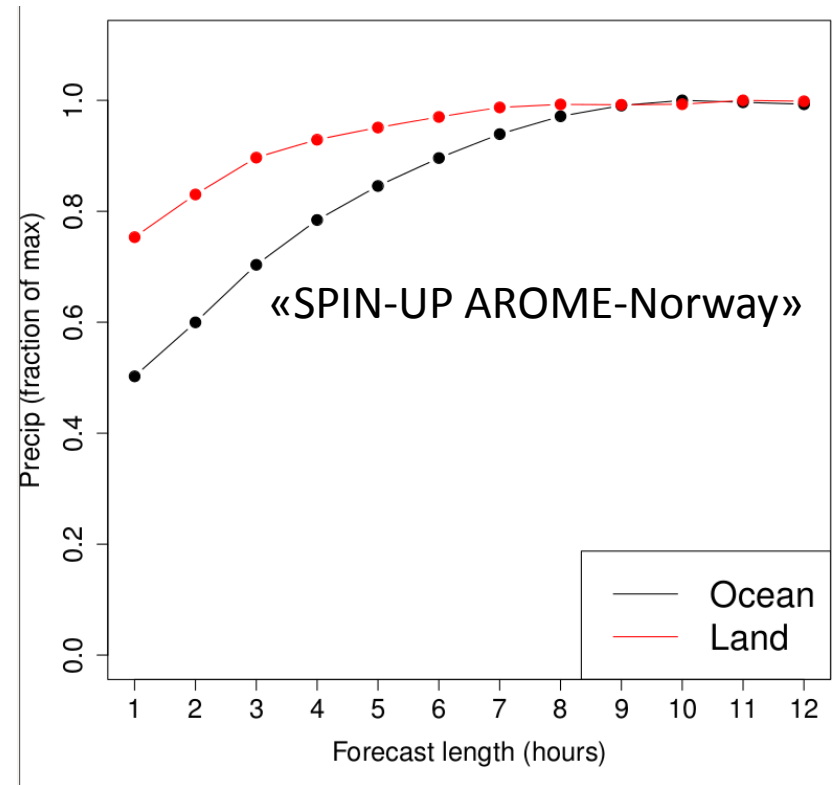
1hr updates of LBC gives better forecasts than 3hr LBS updates (both BE04).

AROME-Norway verifies better than HIRLAM8, but we still need some post-processing to beat posprocessed HIRLAM8 wind speed.

Precipitation winter



Uncertainty due to undercatch of observed solid precipitation.



Long spin-up time over ocean in winter.
(no differences between land/ocean spin-up in summer)

AROME-Norway verifies very well, but too dry?

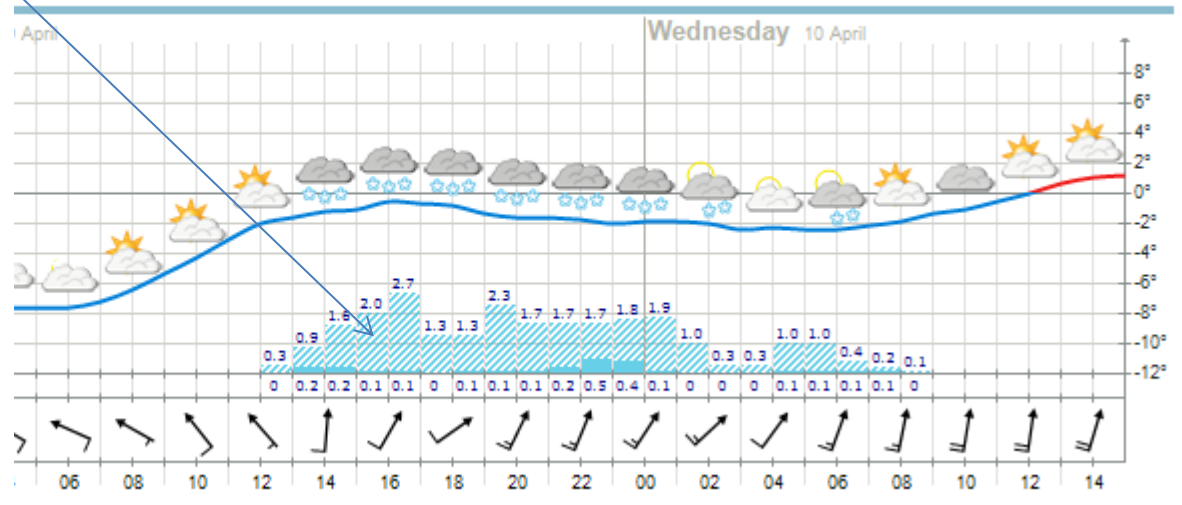
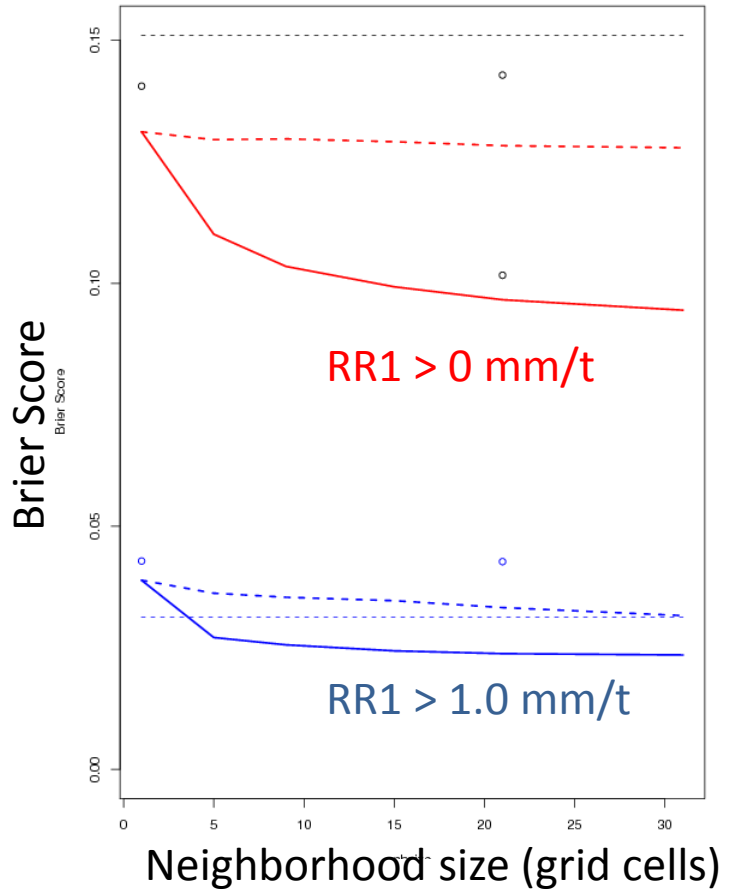
From model output to forecasts at yr.no:

Precipitation forecasts on yr.no use information from a neighborhood (NBH) approach (Roberts & Lean 2008).

Size of neighborhood area? →

Presentation? Chose some high/low percentiles of Precipitation amounts and forecast precipitation within intervals.

Tuesday 13:00		-2°	0.2 – 0.9 mm	↗	Gentle breeze, 5 m/s from south
Tuesday 14:00		-1°	0.2 – 1.6 mm	↗	Gentle breeze, 4 m/s from south-southwest
Tuesday 15:00		-1°	0.1 – 2.0 mm	↗	Gentle breeze, 5 m/s from south-southwest
Tuesday 16:00		-1°	0.1 – 2.7 mm	↗	Moderate breeze, 6 m/s from west-southwest
Tuesday 17:00		-1°	0 – 1.3 mm	↗	Gentle breeze, 5 m/s from southwest
Tuesday 18:00		-1°	0.1 – 1.3 mm	↗	Moderate breeze, 7 m/s from south-southwest
Tuesday 19:00		-1°	0.1 – 2.3 mm	↗	Moderate breeze, 8 m/s from south-southwest
Tuesday 20:00		-2°	0.1 – 1.7 mm	↗	Moderate breeze, 7 m/s from southwest
Tuesday 21:00		-2°	0.2 – 1.7 mm	↗	Moderate breeze, 8 m/s from south-southwest
Tuesday 22:00		-2°	0.5 – 1.7 mm	↗	Fresh breeze, 9 m/s from southwest
Tuesday 23:00		-2°	0.4 – 1.8 mm	↗	Moderate breeze, 7 m/s from south-southwest



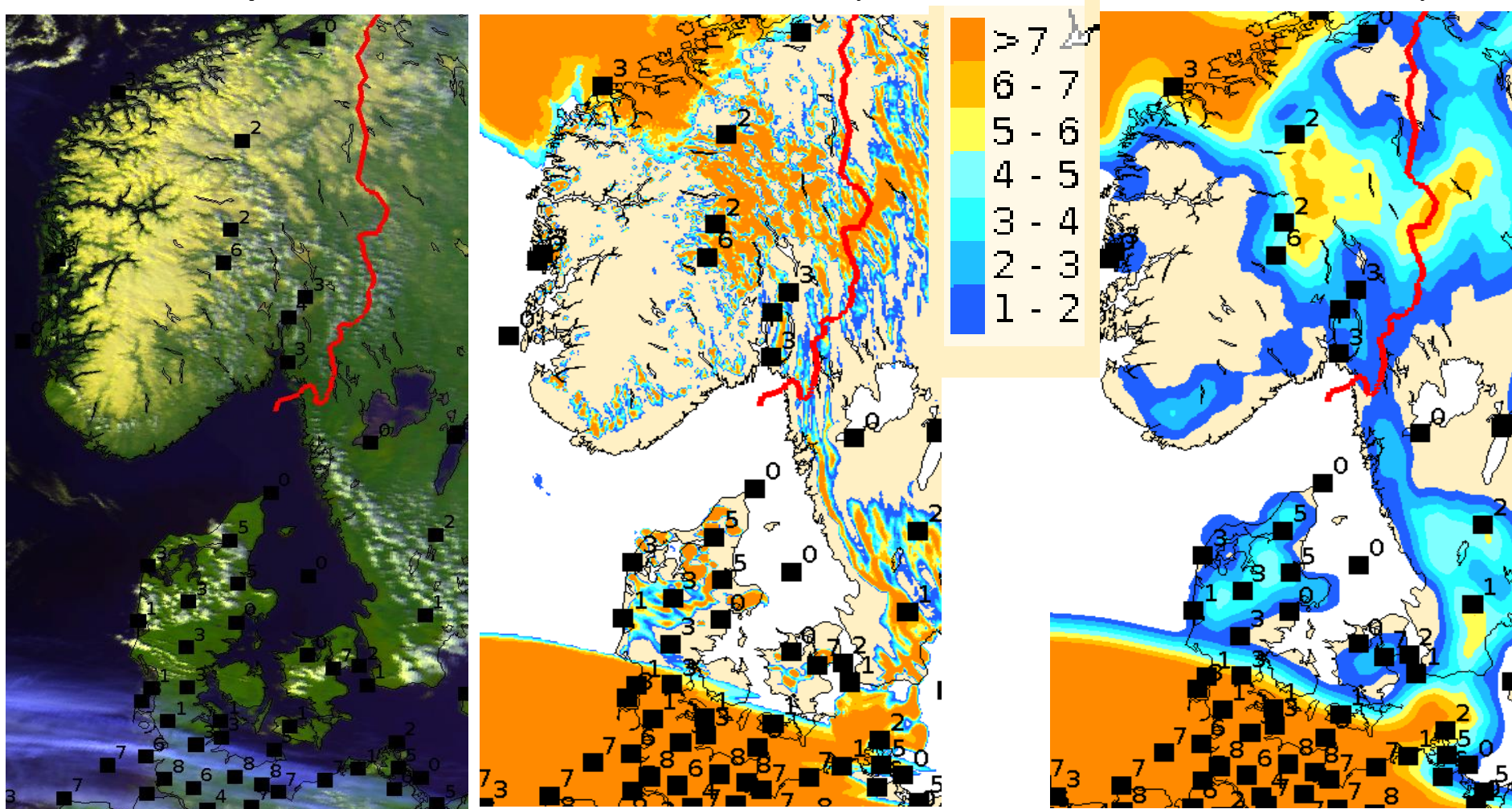
Total cloud cover

- Too many forecasts of “no clouds” or total overcast compared with *manual synop*
- Averaging over NBH area improved model climatology and verification score

15UTC 8.April 2013

AROME-Norway

PP AROME-Norway



Summary

- AROME-Norway with additional post-processing will this summer be the official met.no product for continental Norwegian areas (hopefully😊)
- Quality is on average improved or equal to previous setup. Largest quality improvement seen for precipitation.