



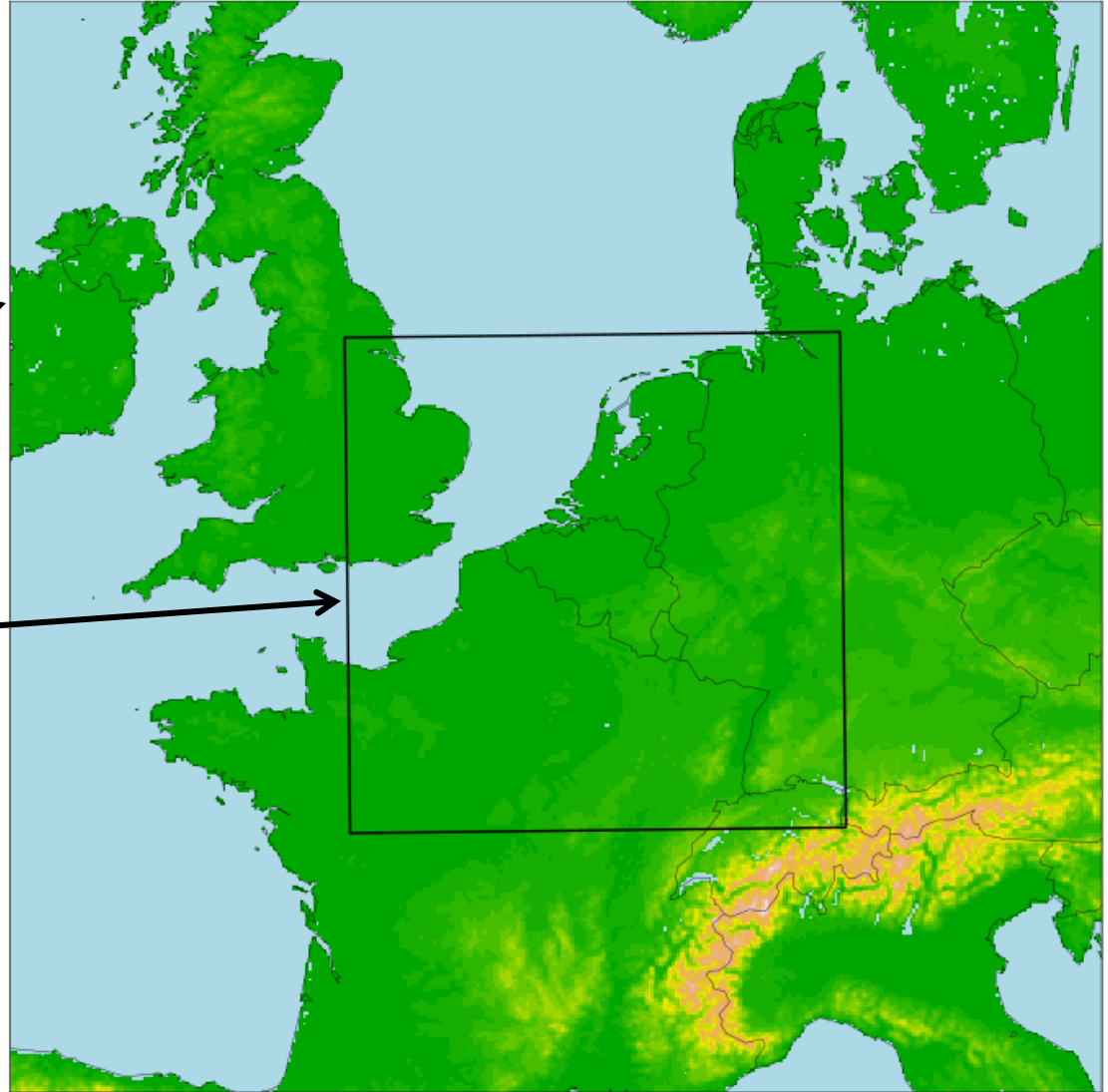
ALARO experience in Belgium

Daan Degrauwe
with help from RMI colleagues

Operational domains

- 4 km

- 1.3 km



ALARO 4km

- cy43t2 (since February 2019, 38t1 before)
- 432 x 432 x 87 gridpoints
- Time step 180s
- Forecast range 60h, 4x per day
- Hydrostatic, VFE
- 3h-coupling to ARPEGE
- ALARO-1 physics:
 - ACRANEB2, TOUCANS, unsaturated downdraught, ISBA



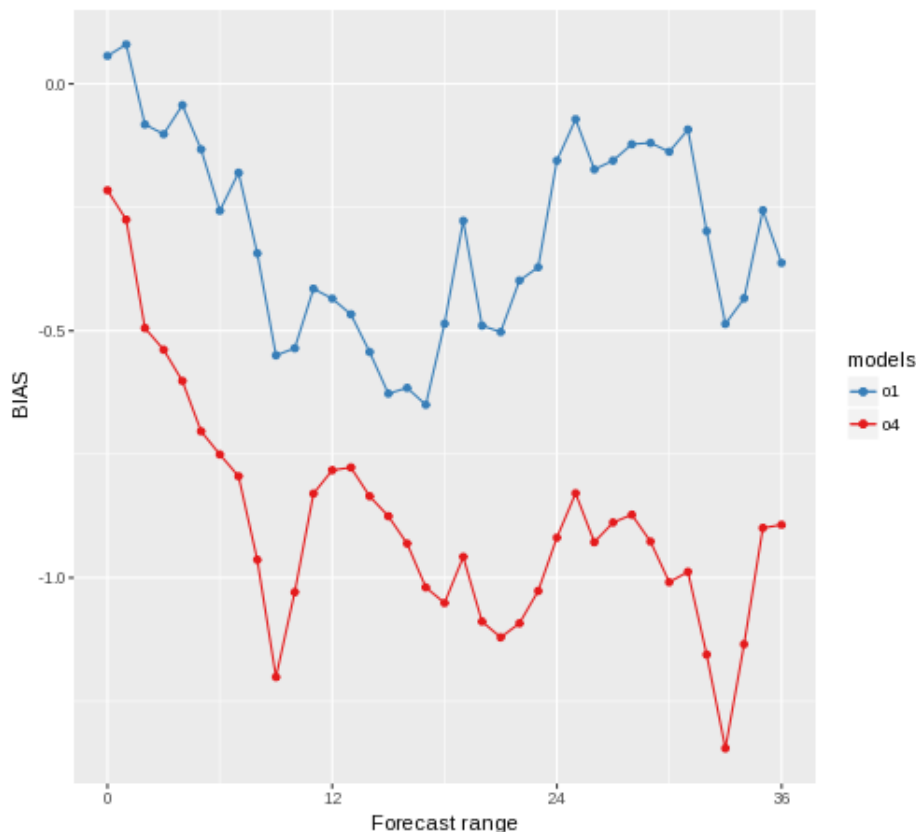
ALARO 1.3km

- cy43t2 (since February 2019, 40t1 before)
- 576 x 576 x 87 gridpoints
- Timestep 45s
- Forecast range 36h
- Non-hydrostatic
- 1h-coupling to ALARO-4km
- Same physics settings as ALARO-4km (including ISBA)

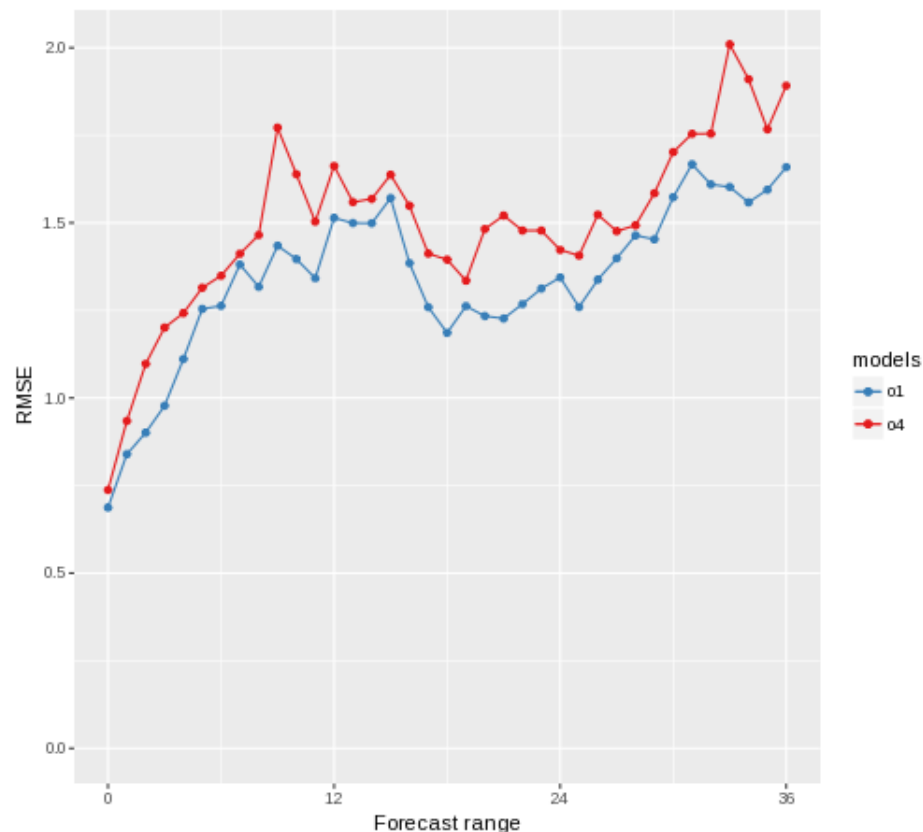
- High-frequency precipitation output for stochastic nowcasting STEPS

Operational scores: Winter 2m temperature

BIAS T2m
20181201 - 20190228 00h
station Ukkel (6447)



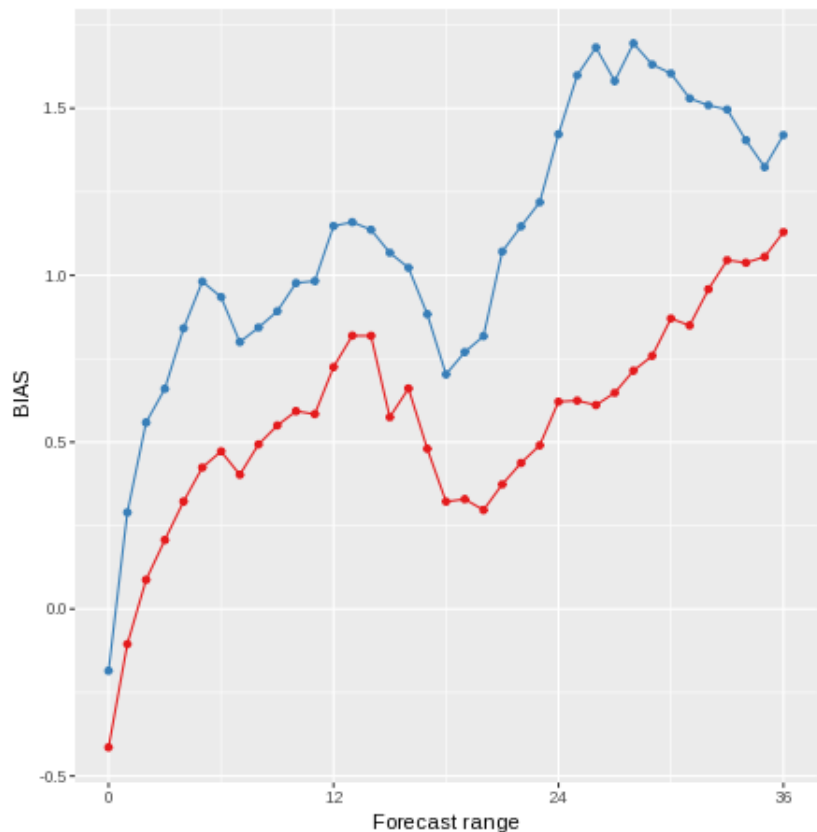
RMSE T2m
20181201 - 20190228 00h
station Ukkel (6447)



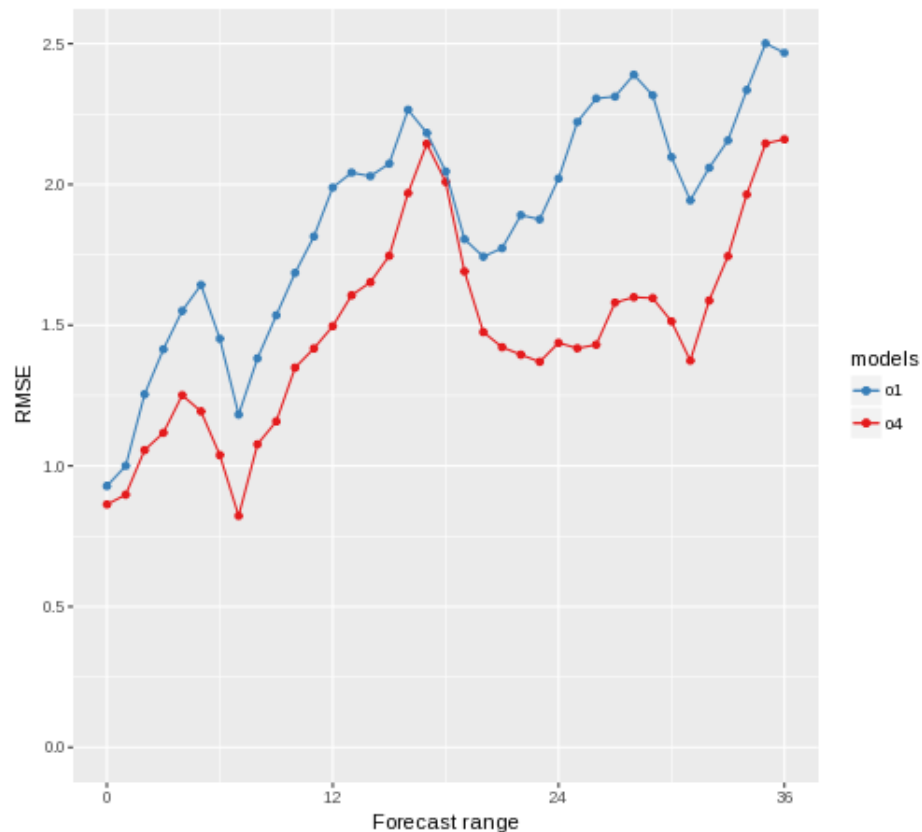
- Bias much smaller in ALARO 1.3km

Operational scores: Summer 2m temperature

BIAS T2m
20180601 - 20180831 00h
station Ukkel (6447)



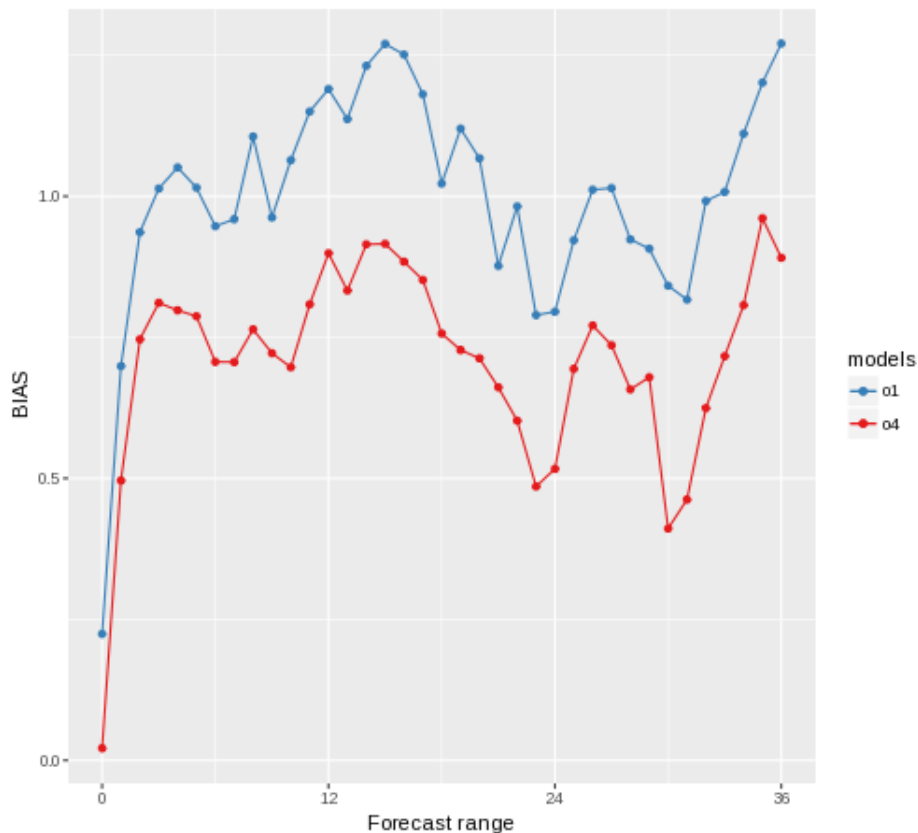
RMSE T2m
20180601 - 20180831 00h
station Ukkel (6447)



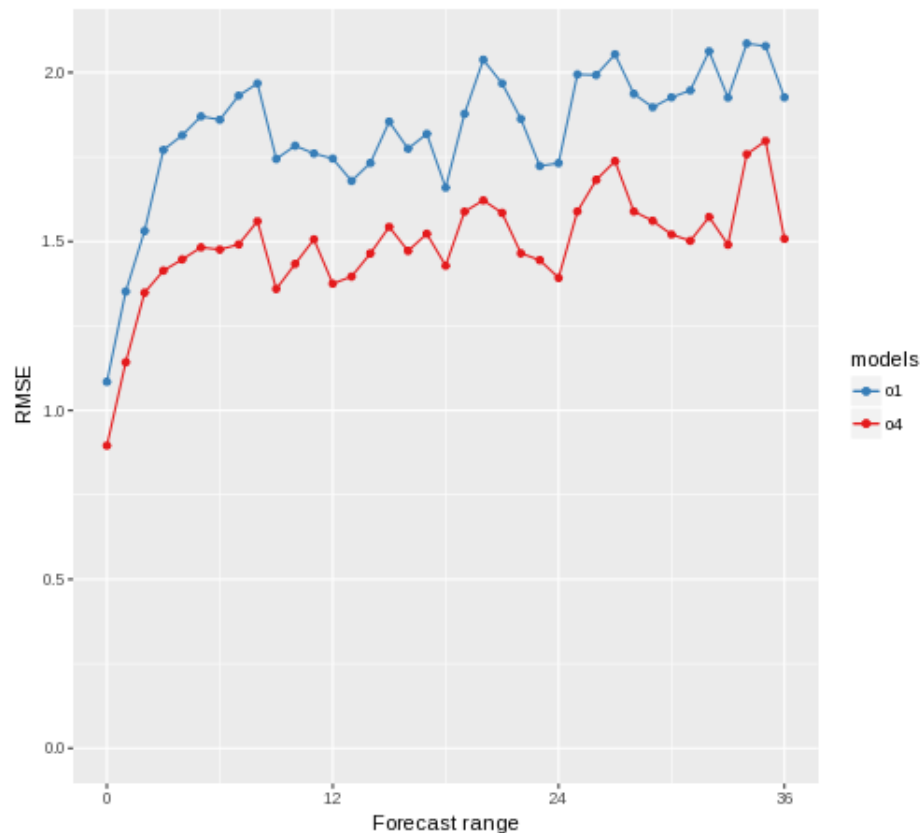
- Bias higher in ALARO 1.3km!

Operational scores: Winter 10m wind speed

BIAS S10m
20181201 - 20190228 00h
station Ukkel (6447)



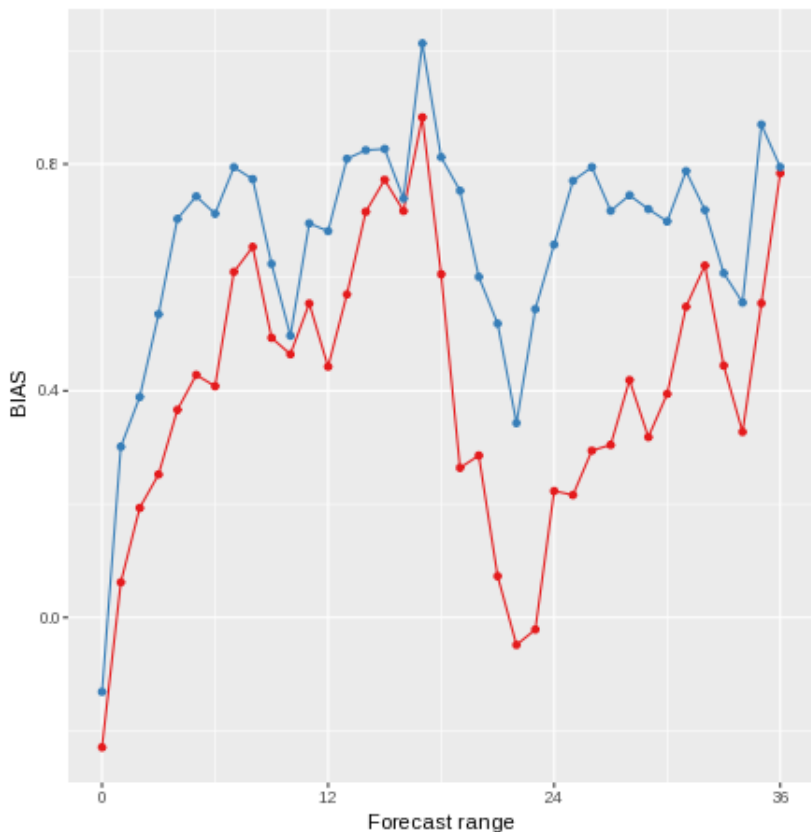
RMSE S10m
20181201 - 20190228 00h
station Ukkel (6447)



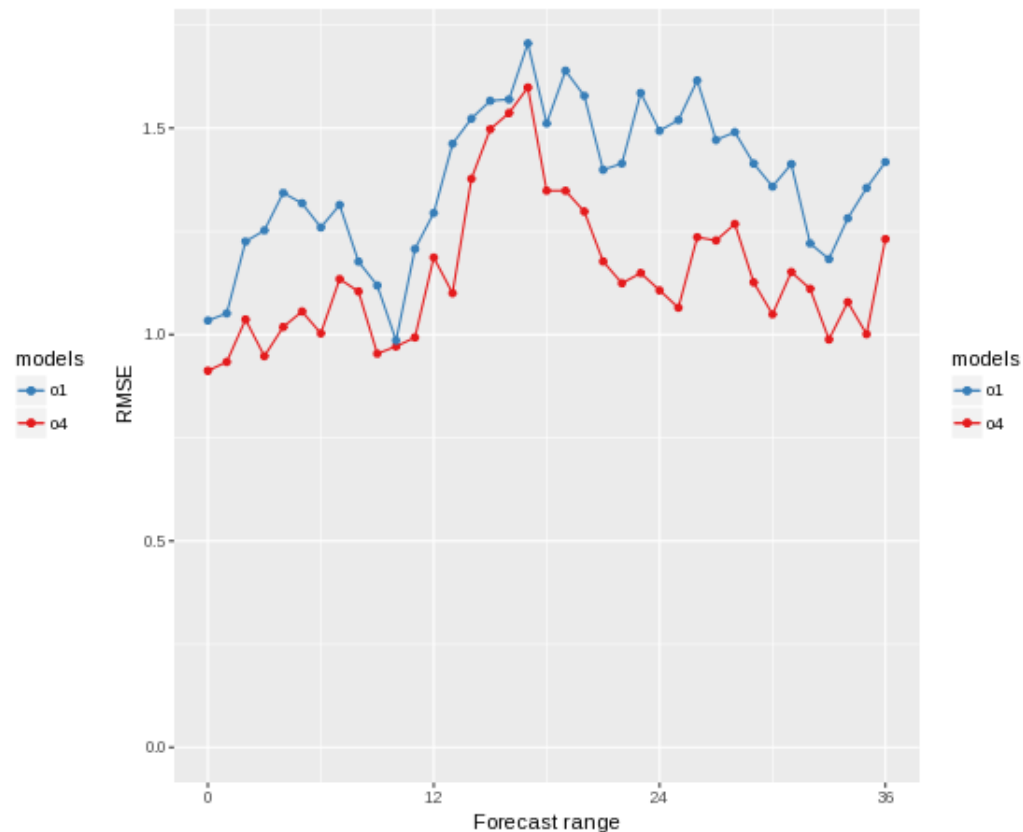
- ALARO 1.3km worse than ALARO 4km

Operational scores: Summer 10m wind speed

BIAS S10m
20180601 - 20180831 00h
station Ukkel (6447)



RMSE S10m
20180601 - 20180831 00h
station Ukkel (6447)



- ALARO 1.3km slightly worse

Case study: December 11, 2017

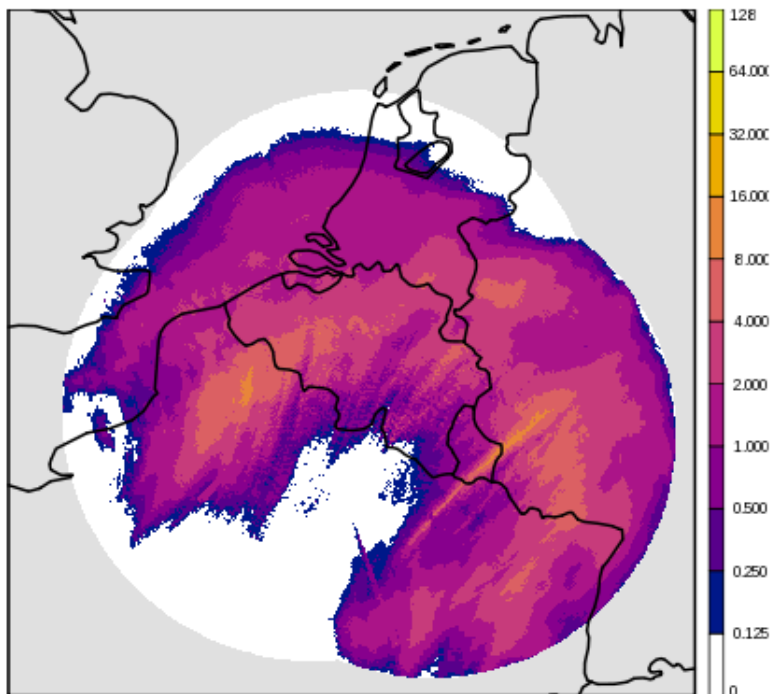
- Snowcase leading to 600km of traffic jams, collapsing structures, ...



Case study: December 11, 2017

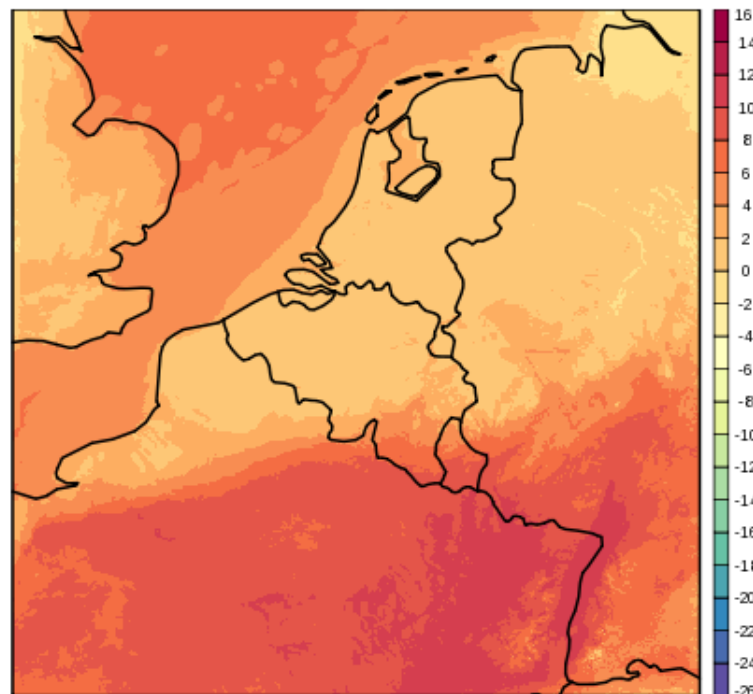
- Difficult case: timing, location, precipitation type ...

3h precipitation
2017-12-11:12h



radar composite

2m Temperature
2017-12-10:00 +36h

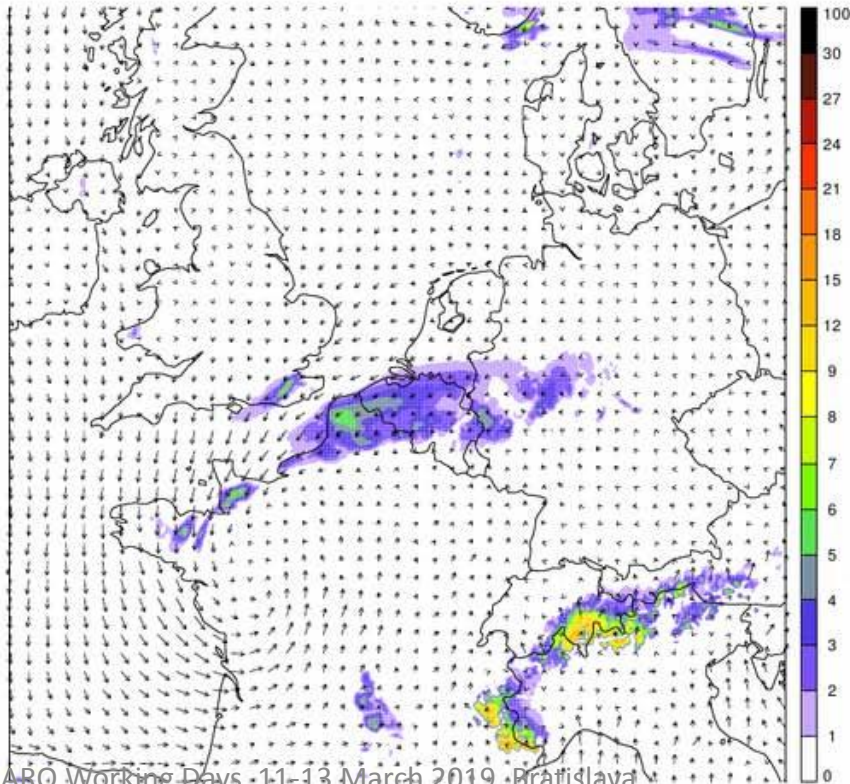


Alaro 1.3km

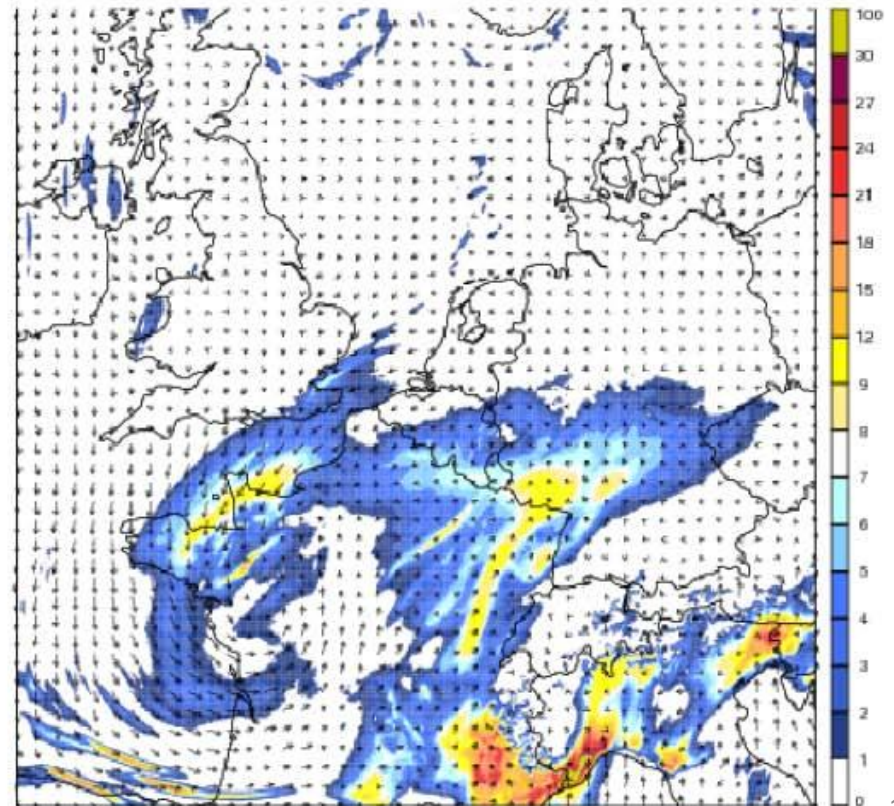
Case study: December 11, 2017

- ... but very well-predicted by ALARO!

AL04 10 12 2017 [00h]
3-HR SNOW : +33 h to +36 h

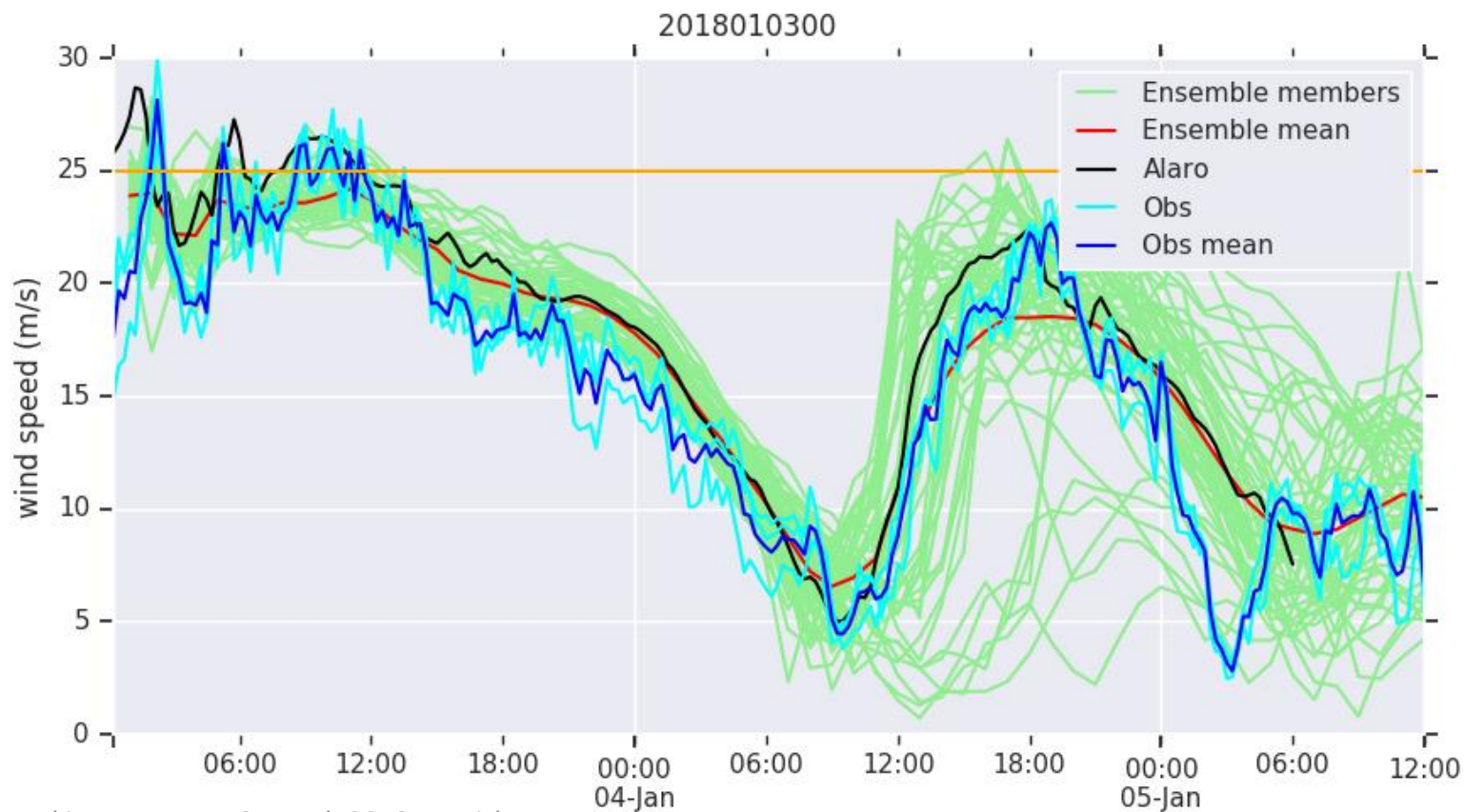


AL04 10 12 2017 [00h]
3-HR RAIN: +33 h to +36 h



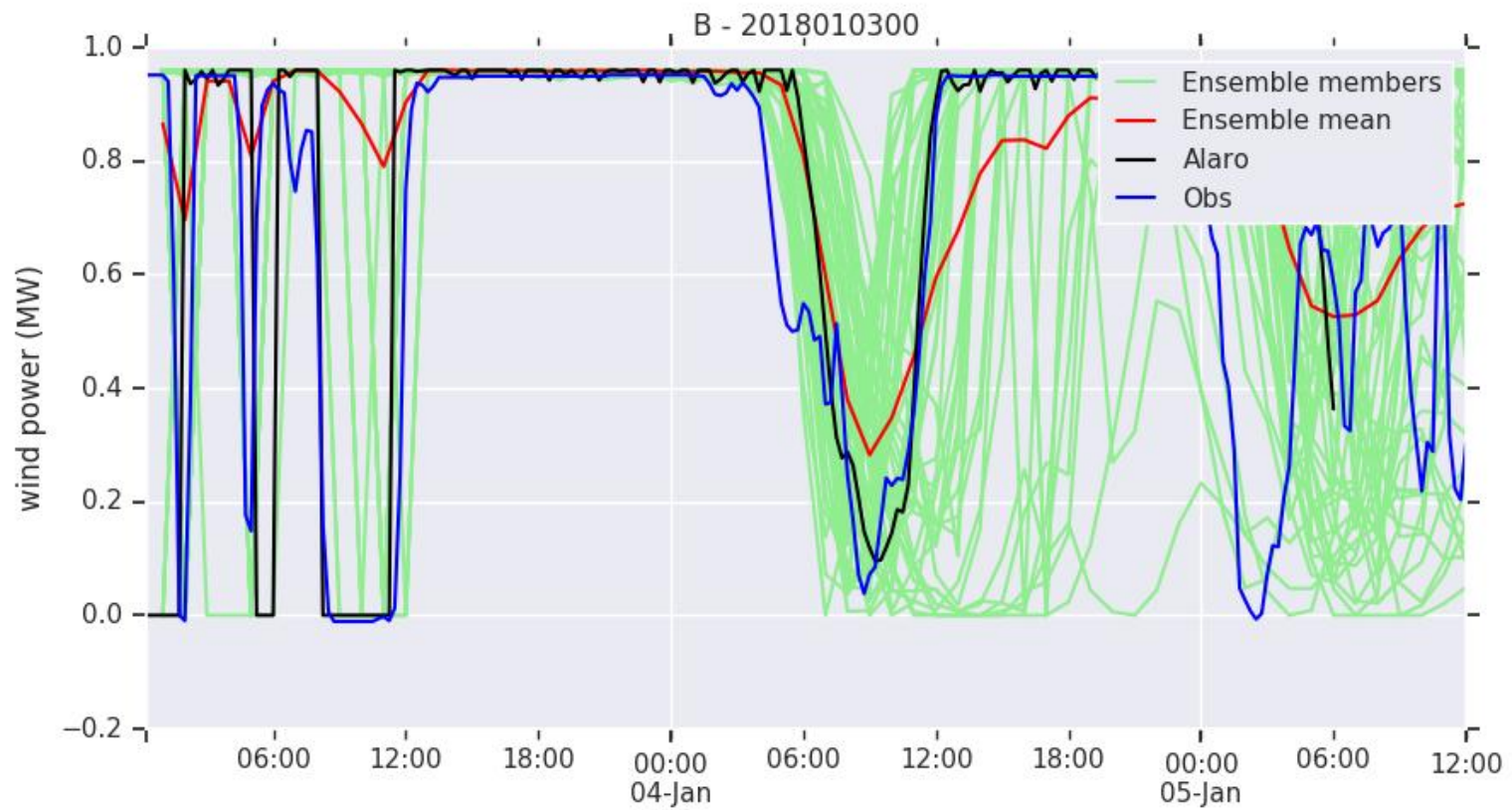
Application: wind energy

- Forecast (EC-EPS & ALARO) of 100m wind for offshore wind farm



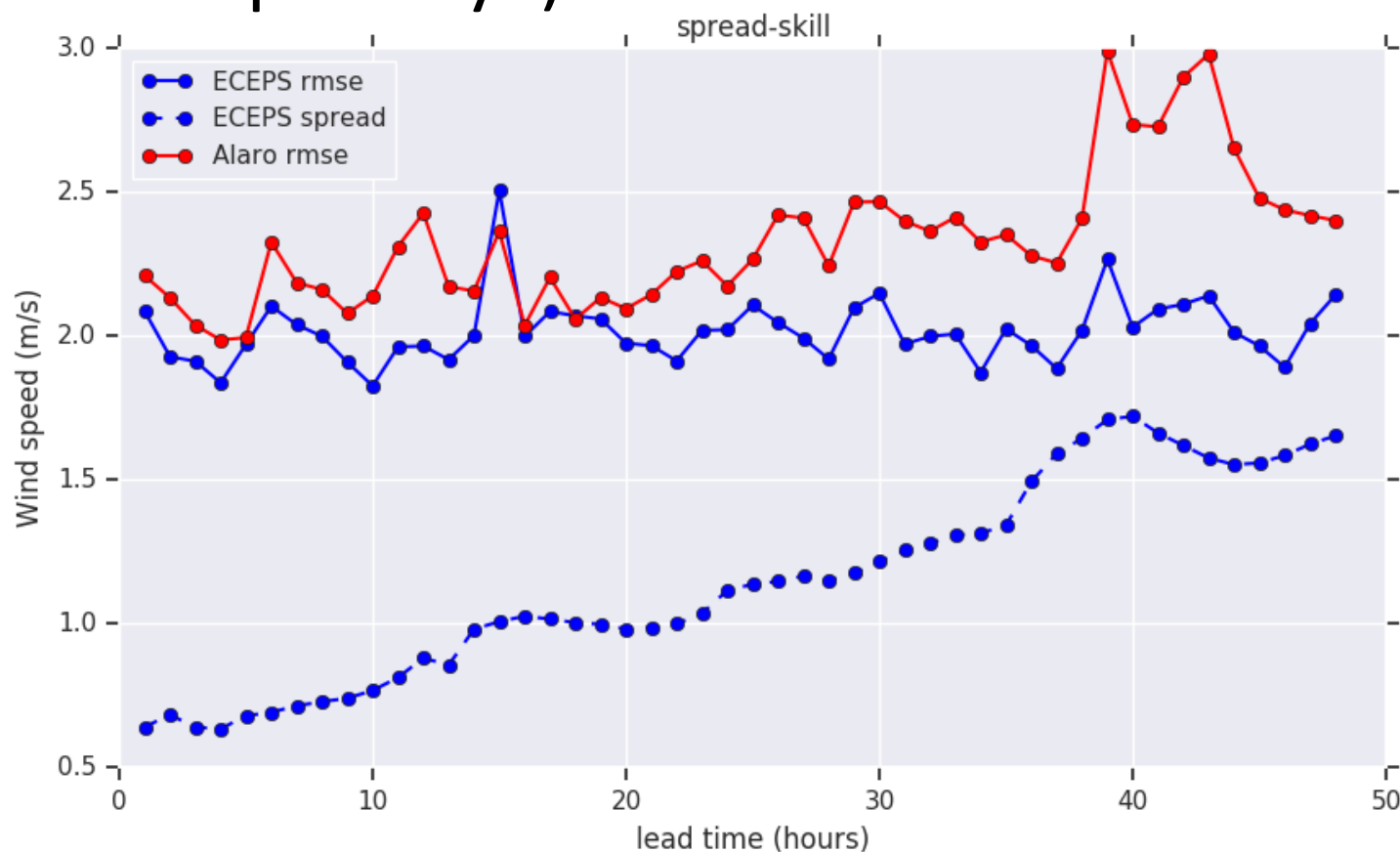
Application: wind energy

- Output power is a nonlinear function of wind speed + cut-out at high wind speeds



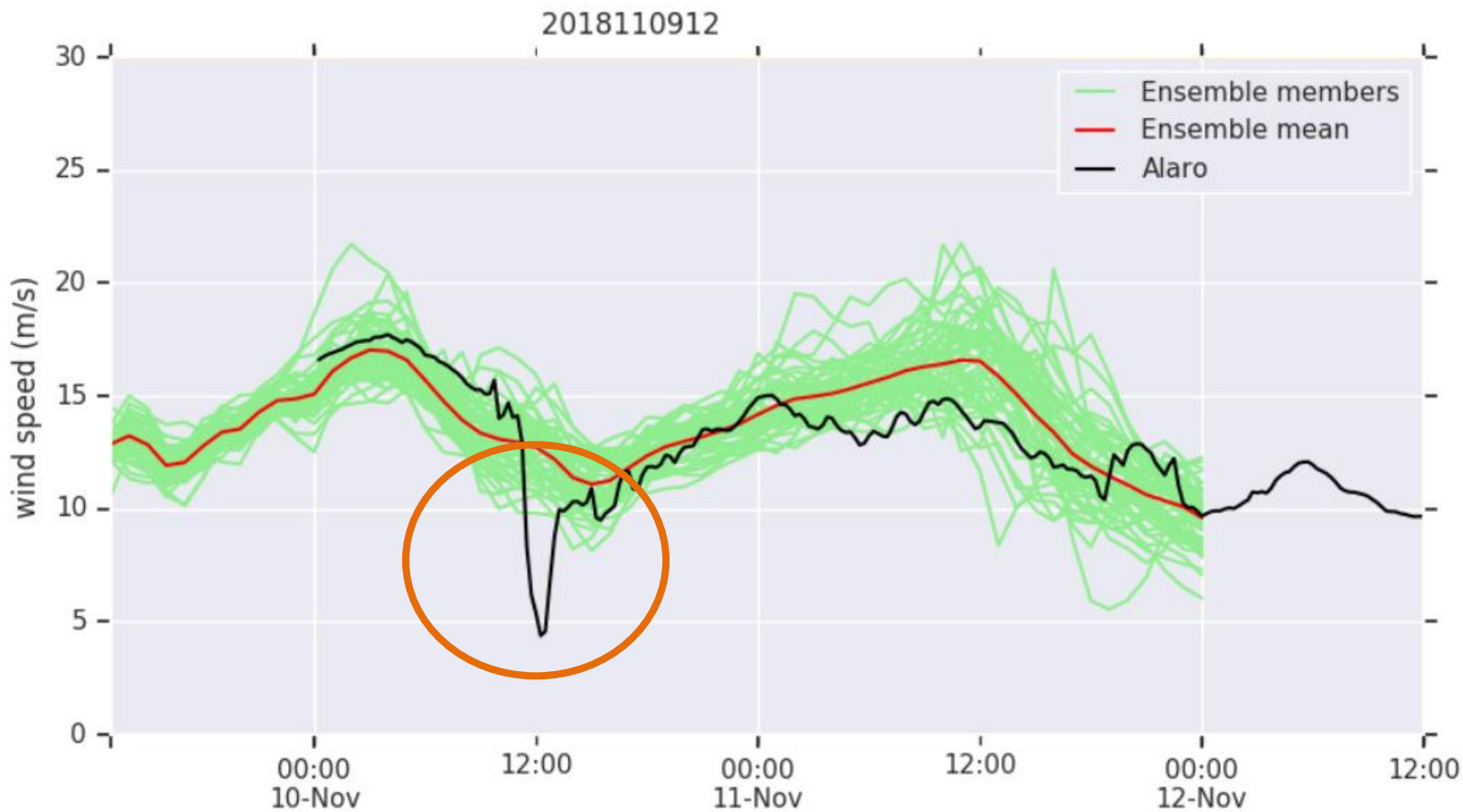
Application: wind energy

- ALARO scores slightly worse than EC-EPS (double penalty?)



Application: wind energy

- Occasional sudden drop in ALARO wind speed

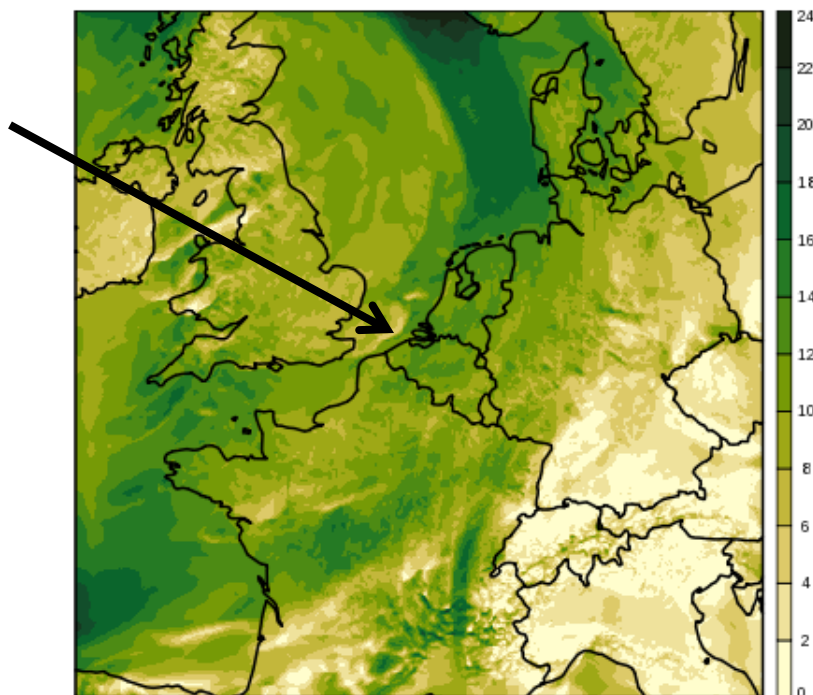


Note: 1h output of EC-EPS

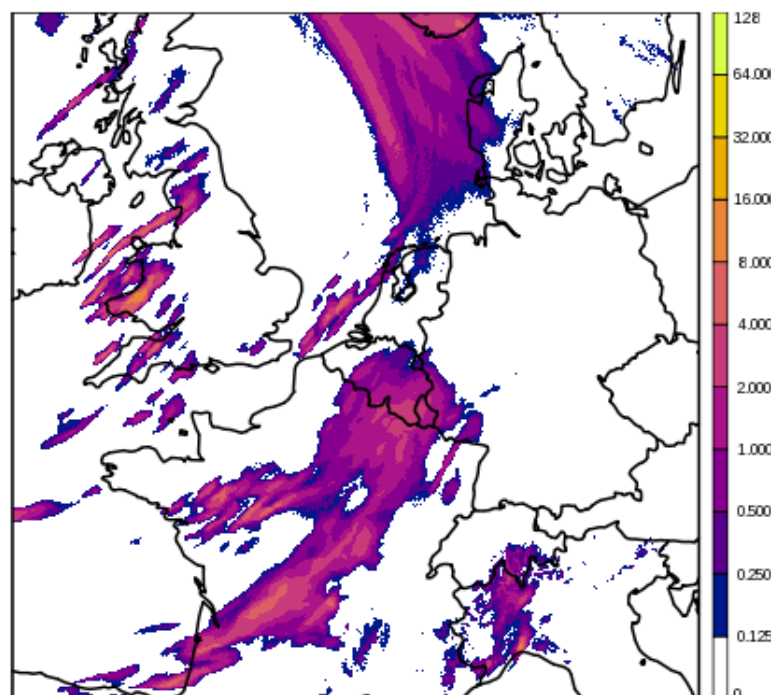
Application: wind energy

- Occasional sudden drop in ALARO wind speed
- Seems related to precipitation

100m Wind Speed
2018-11-10:00 +12h



1h Precipitation
2018-11-10:00 +12h



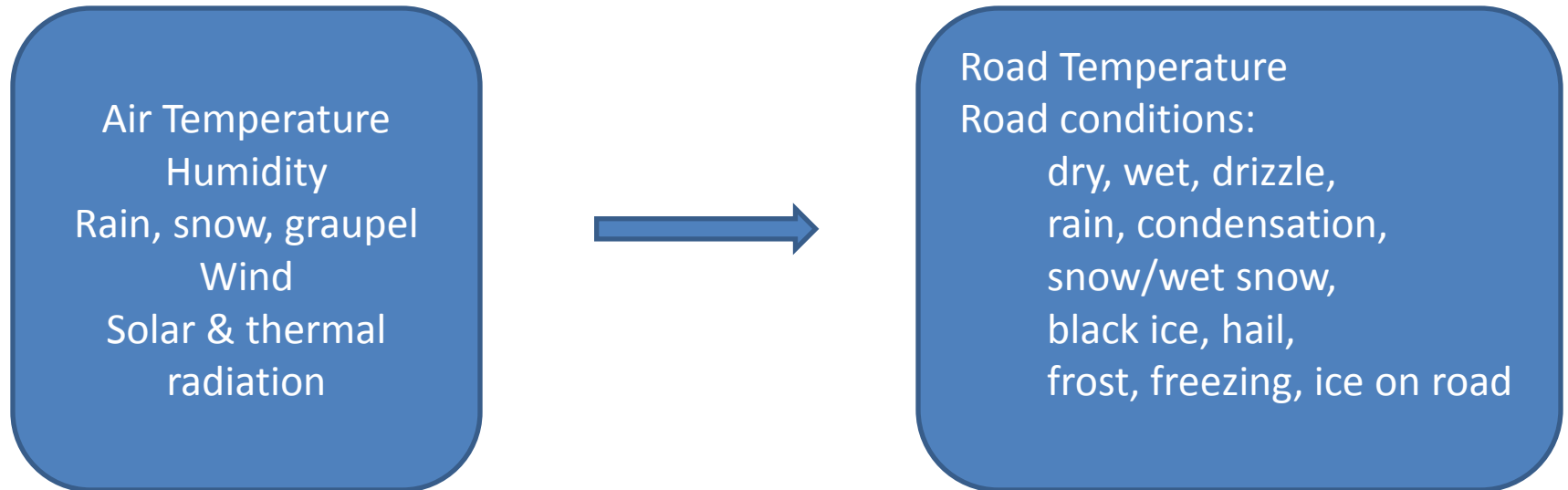
Alaro 4km

Alaro 4km

Application: road weather

(courtesy S. Tijm & J. Van den Bergh)

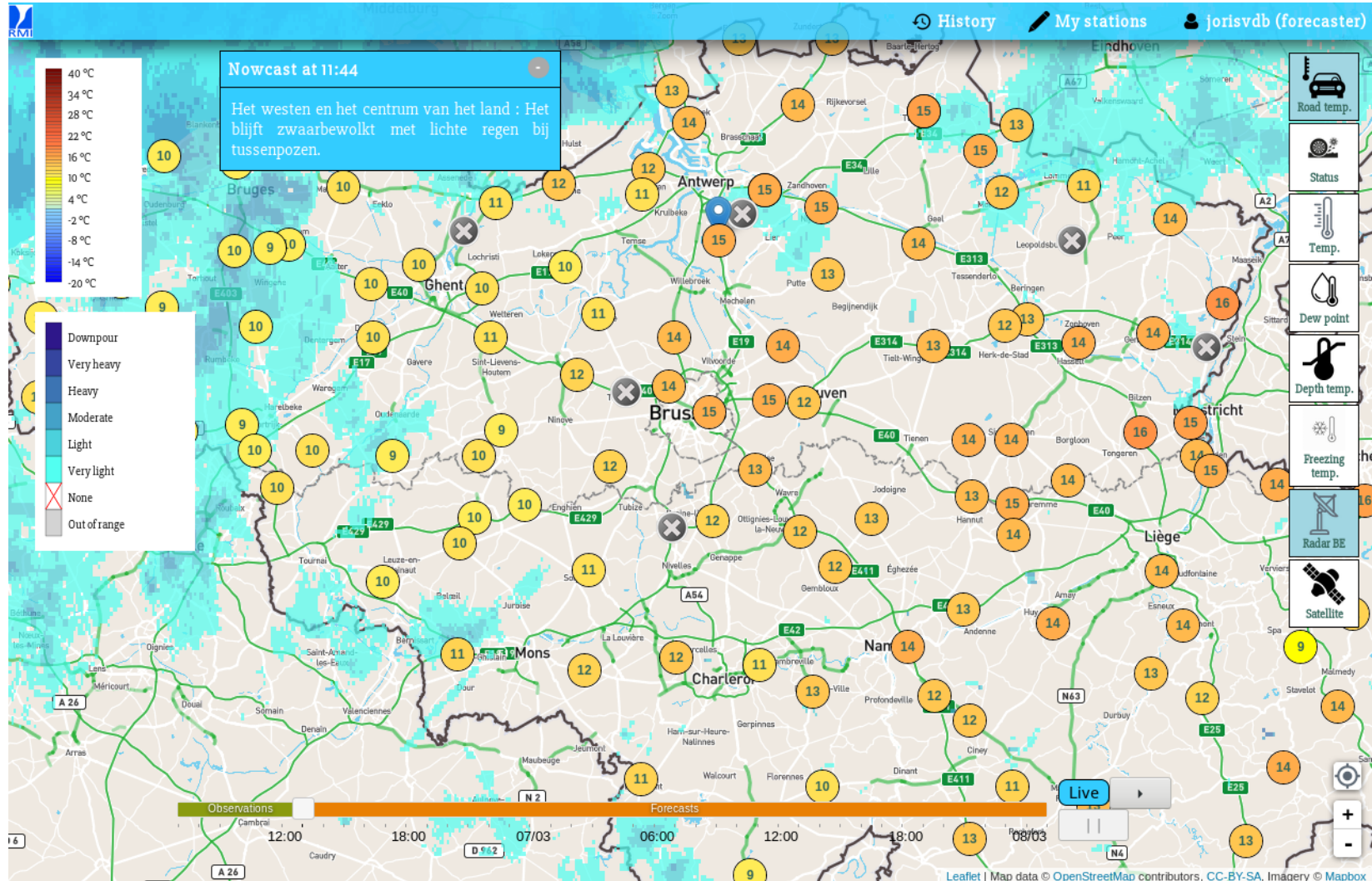
- Forcing KNMI road weather model (Karsisto et al., 2017) with RMI ALARO data:



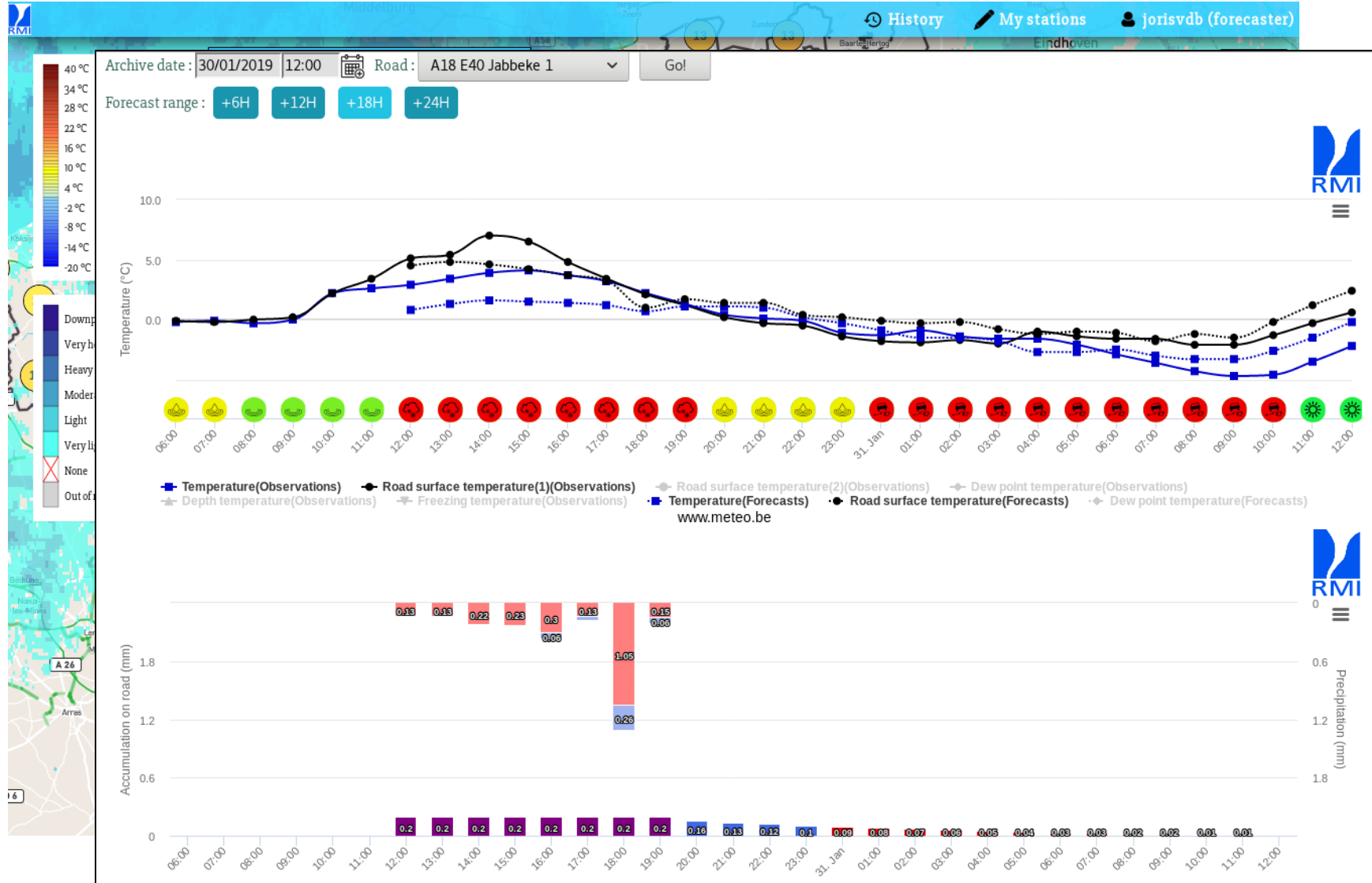
Application: road weather

- Some features:
 - 20 soil layers
 - Output for point locations with graphical interface
 - Nudging of initial state with local observations
 - Accounting for local conditions (bridges, sky-view factor)

Application: road weather



Application: road weather



Future Plans

- SURFEX (with TEB)
ALARO - 1.3km
- Data Assimilation:
 - Surface DA for ALARO - 1.3km (with SURFEX)
~ 2019
 - Local observations (radar)
~ long-term

A scenic view of a sandy beach with green dunes in the foreground and a blue ocean under a cloudy sky. The text "Thank you!" is centered over the image.

Thank you!