ALARO experience in Belgium

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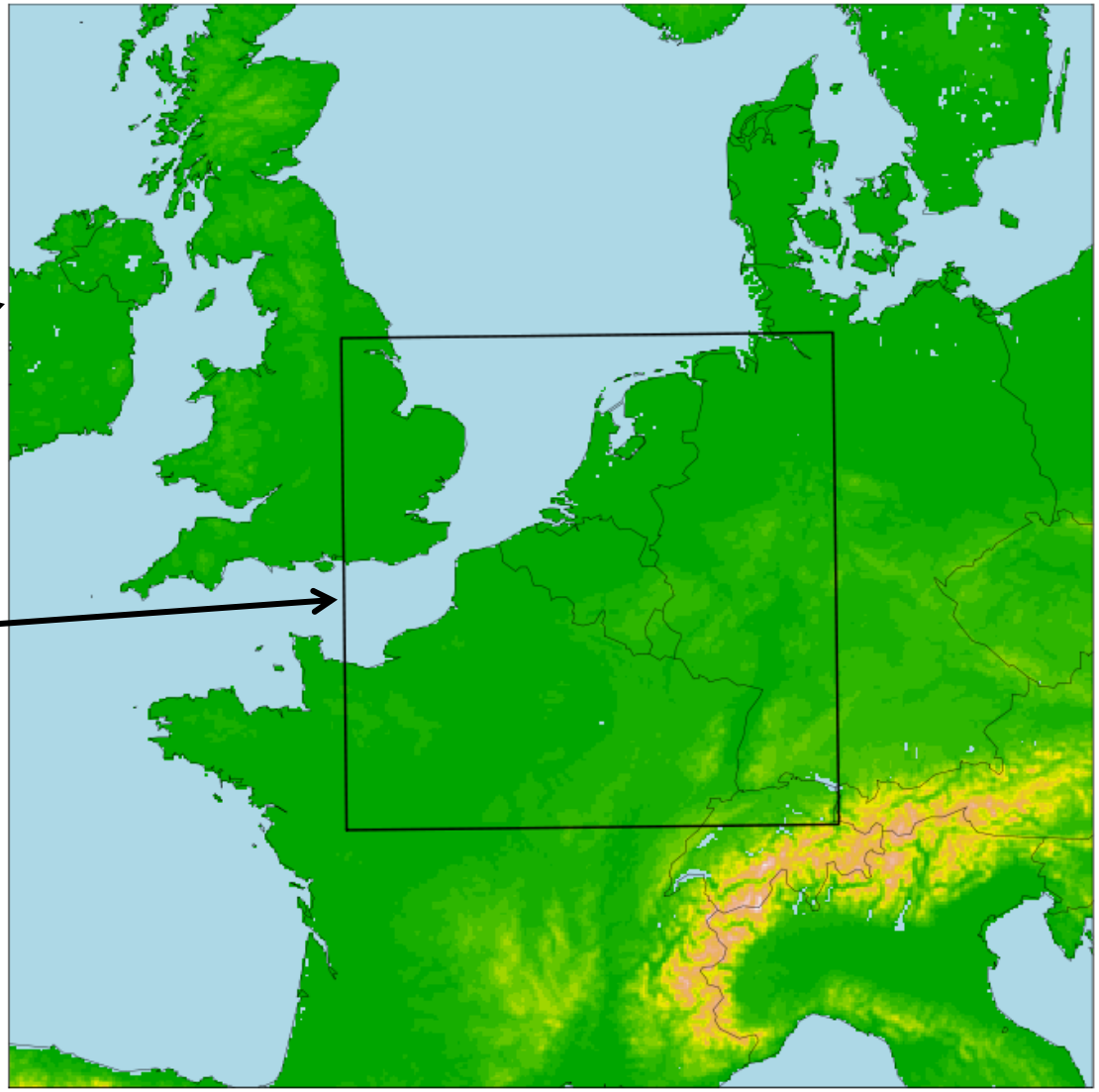
with help from RMI colleagues

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:

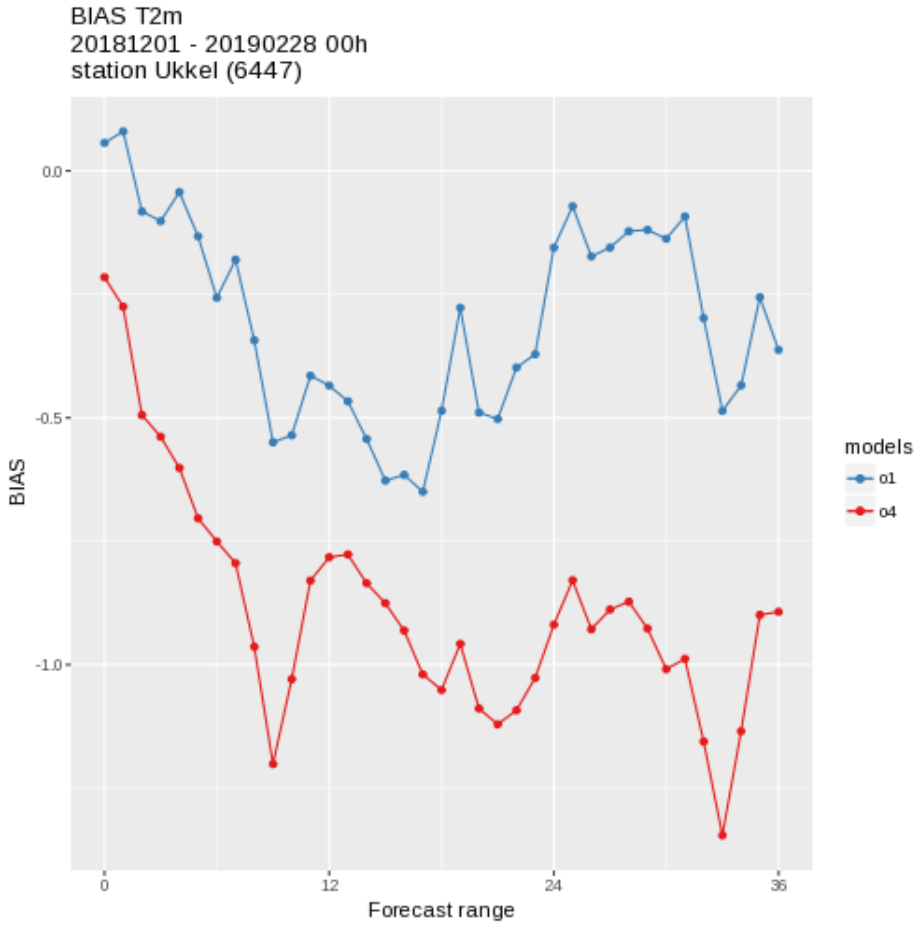
  ACRANEB2, TOUCANS, unsaturated downdraught, ISBA

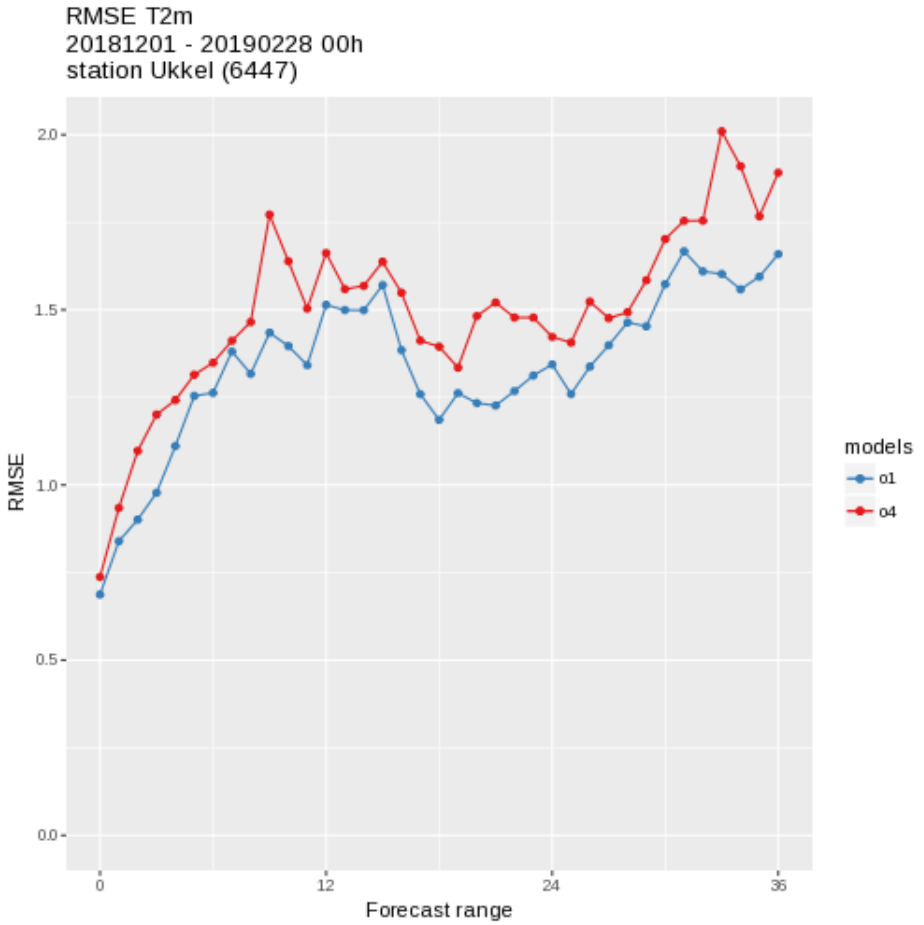
ALARO 1.3km

- 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

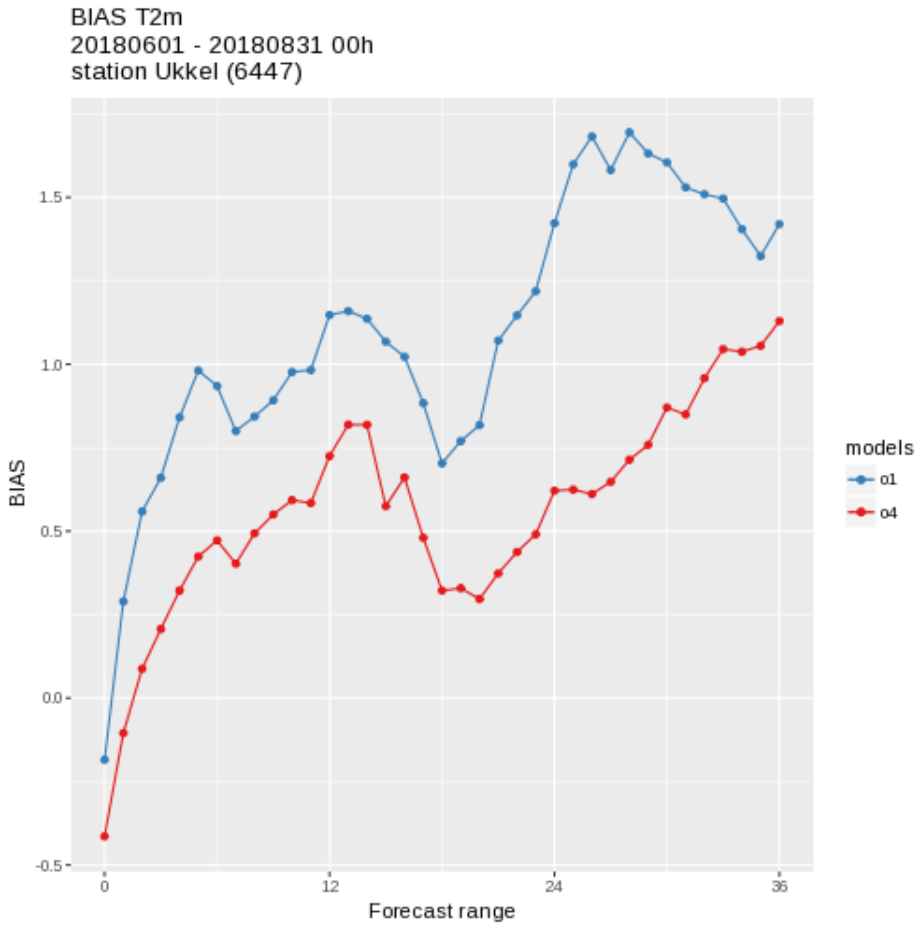
Operational scores: Winter 2m temperature

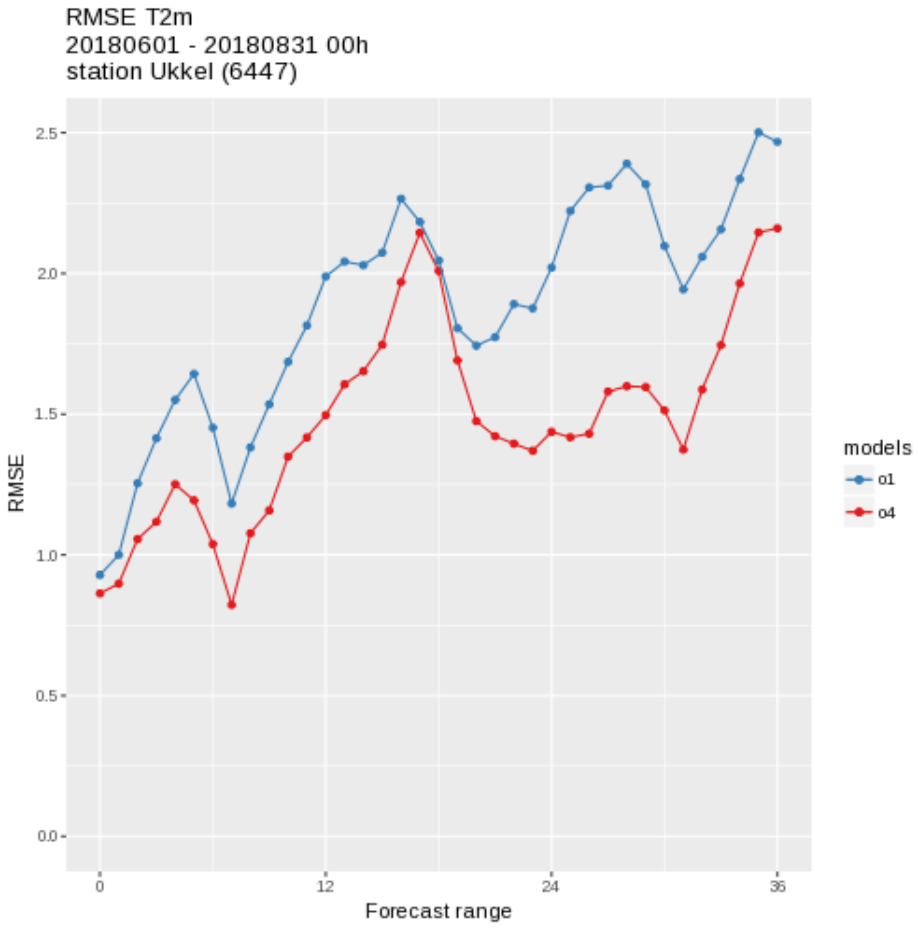




- Bias much smaller in ALARO 1.3km

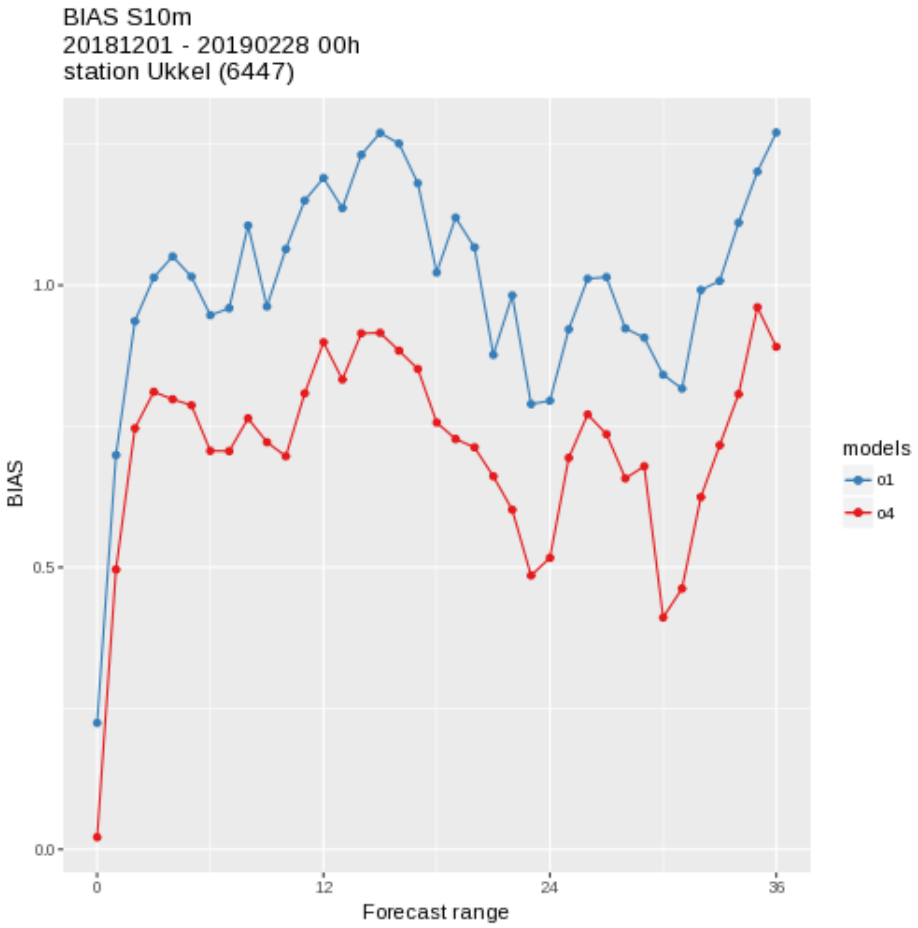
Operational scores: Summer 2m temperature

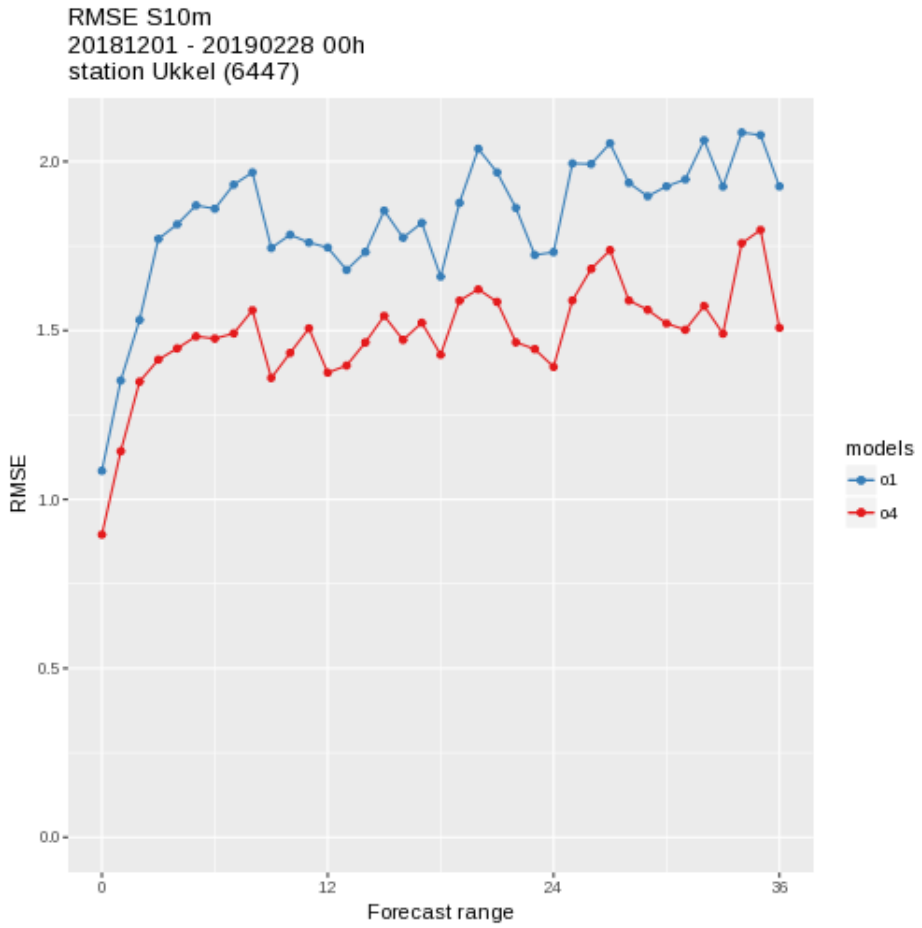




- Bias higher in ALARO 1.3km!

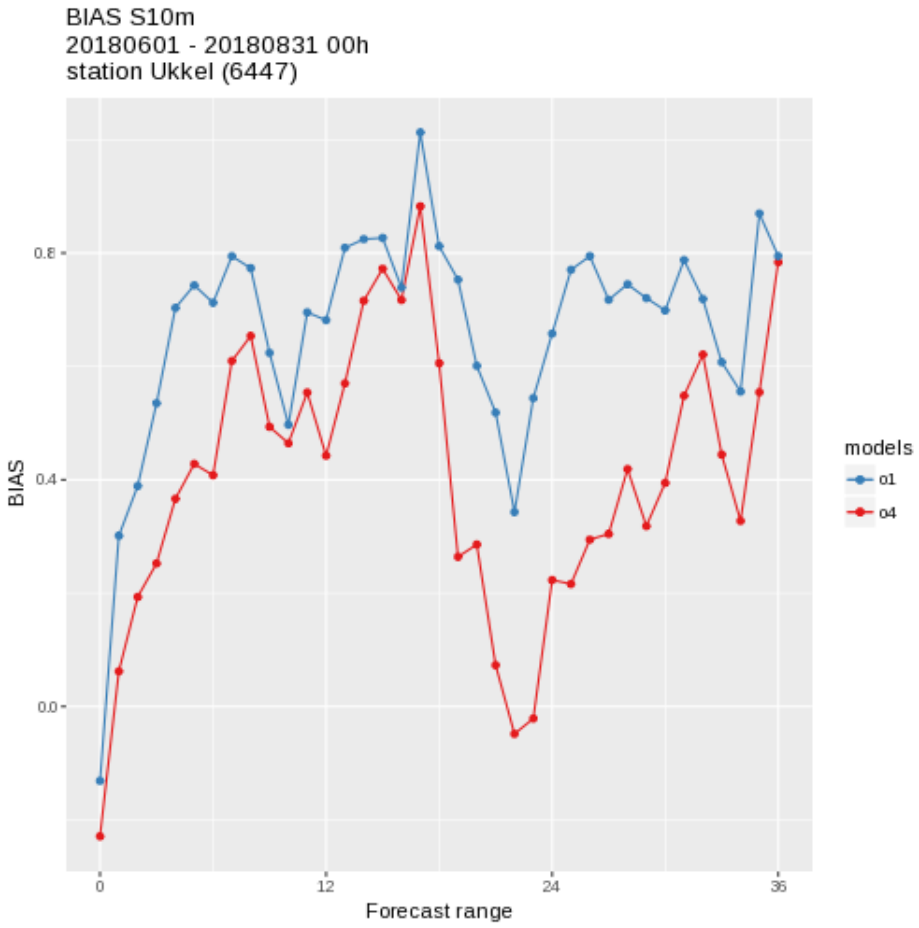
Operational scores: Winter 10m wind speed

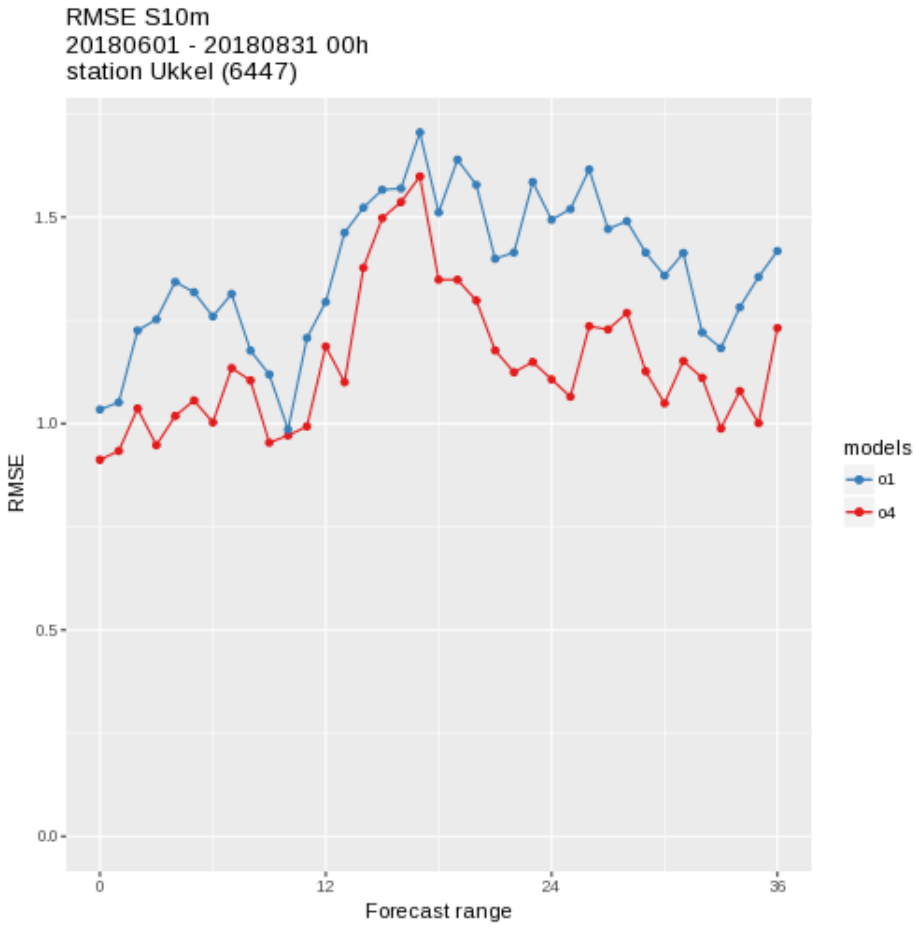




- ALARO 1.3km worse than ALARO 4km

Operational scores: Summer 10m wind speed





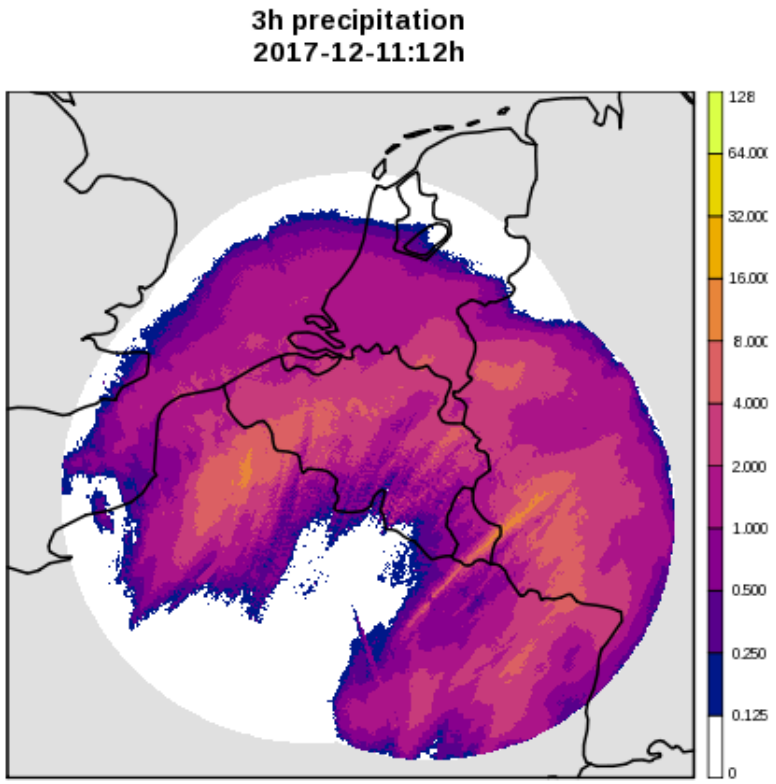
- ALARO 1.3km slightly worse

Case study: December 11, 2017

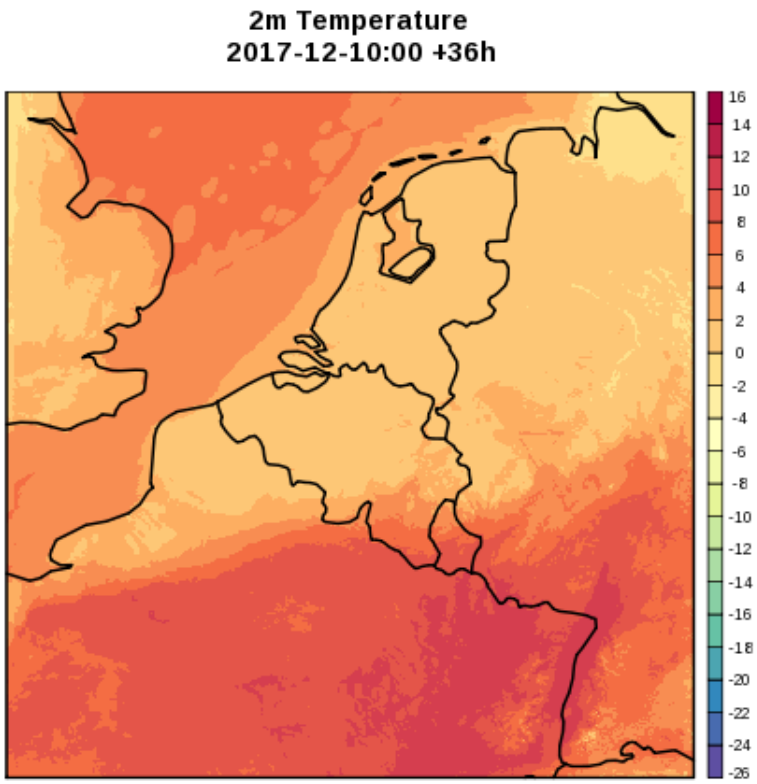
- Snowcase leading to 600km of traffic jams, collapsing structures, …

Case study: December 11, 2017

- Difficult case: timing, location, precipitation type …



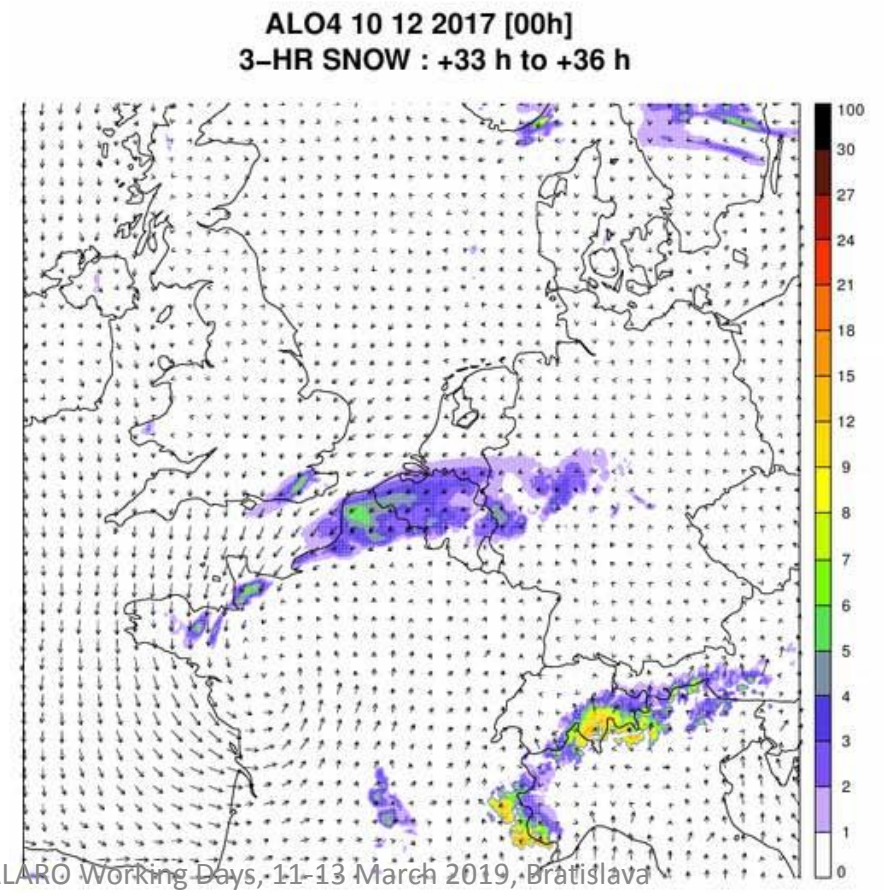
radar composite

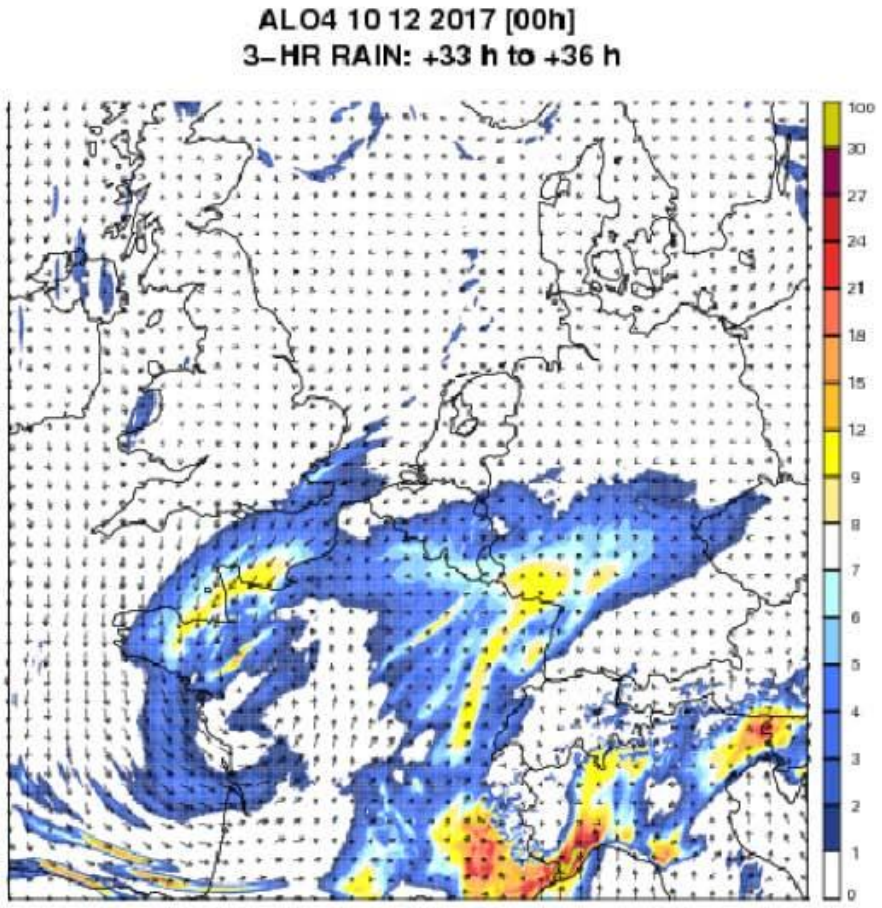


Alaro 1.3km

Case study: December 11, 2017

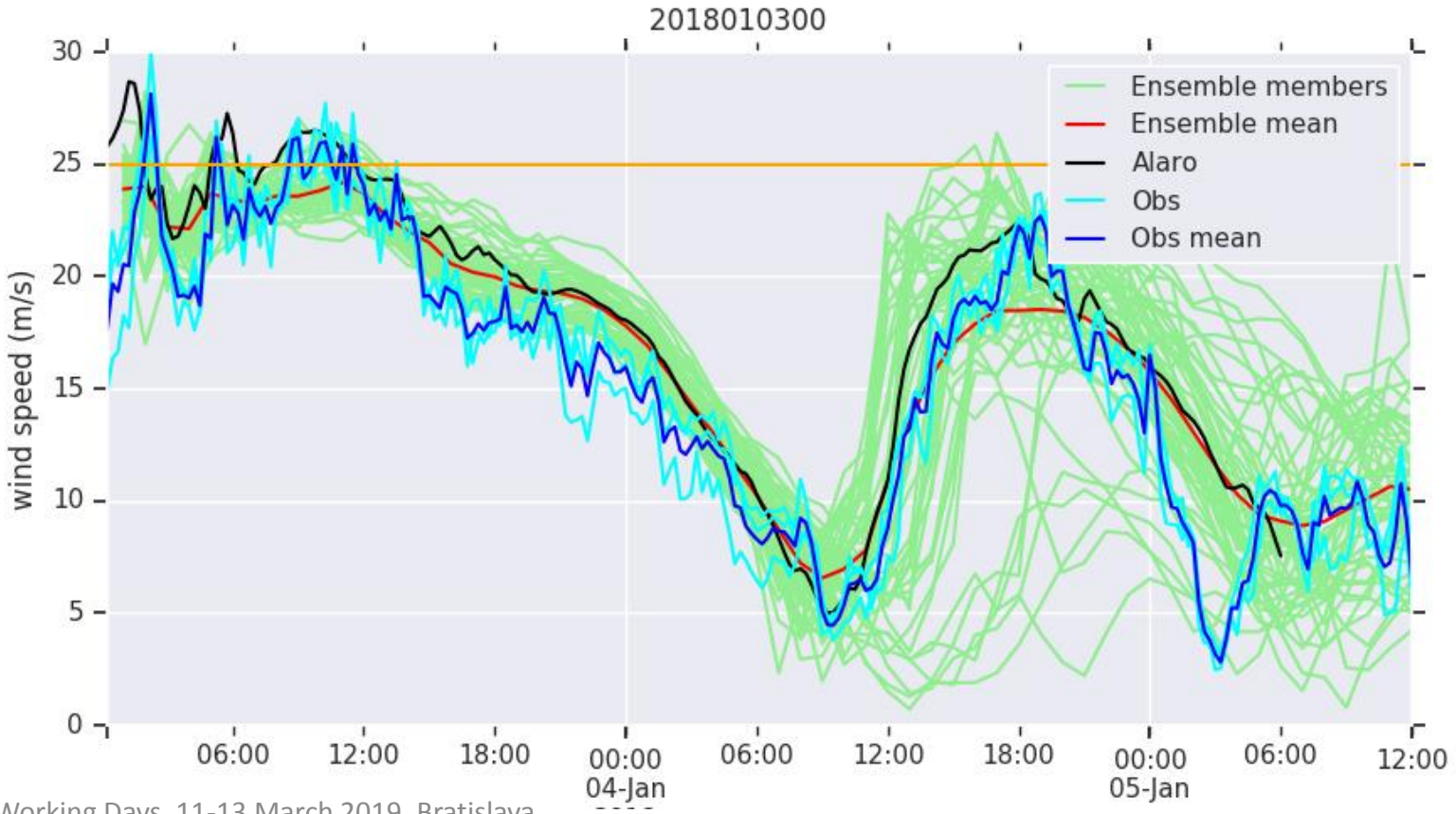
- … but very well-predicted by ALARO!





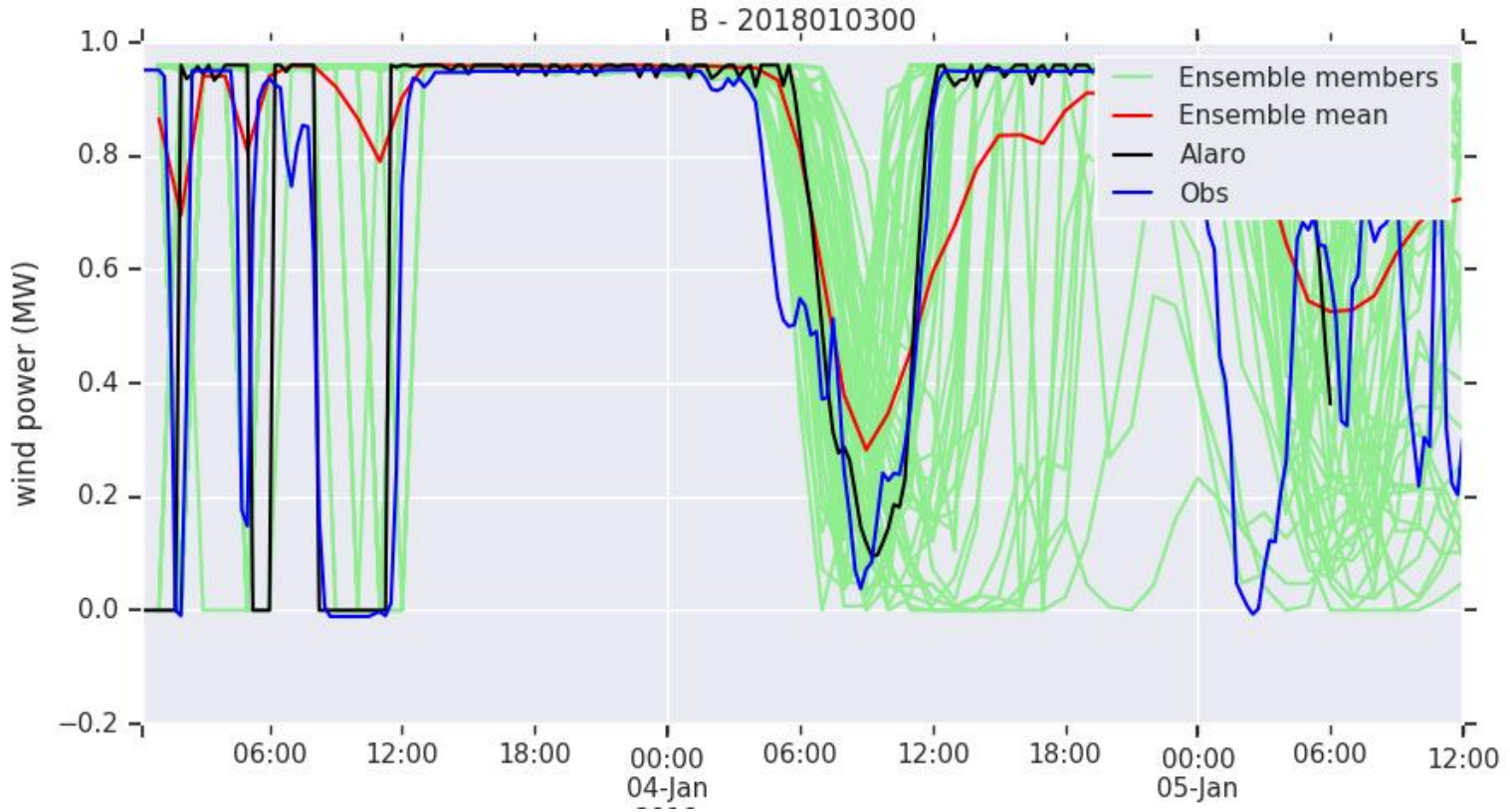
Application: wind energy

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



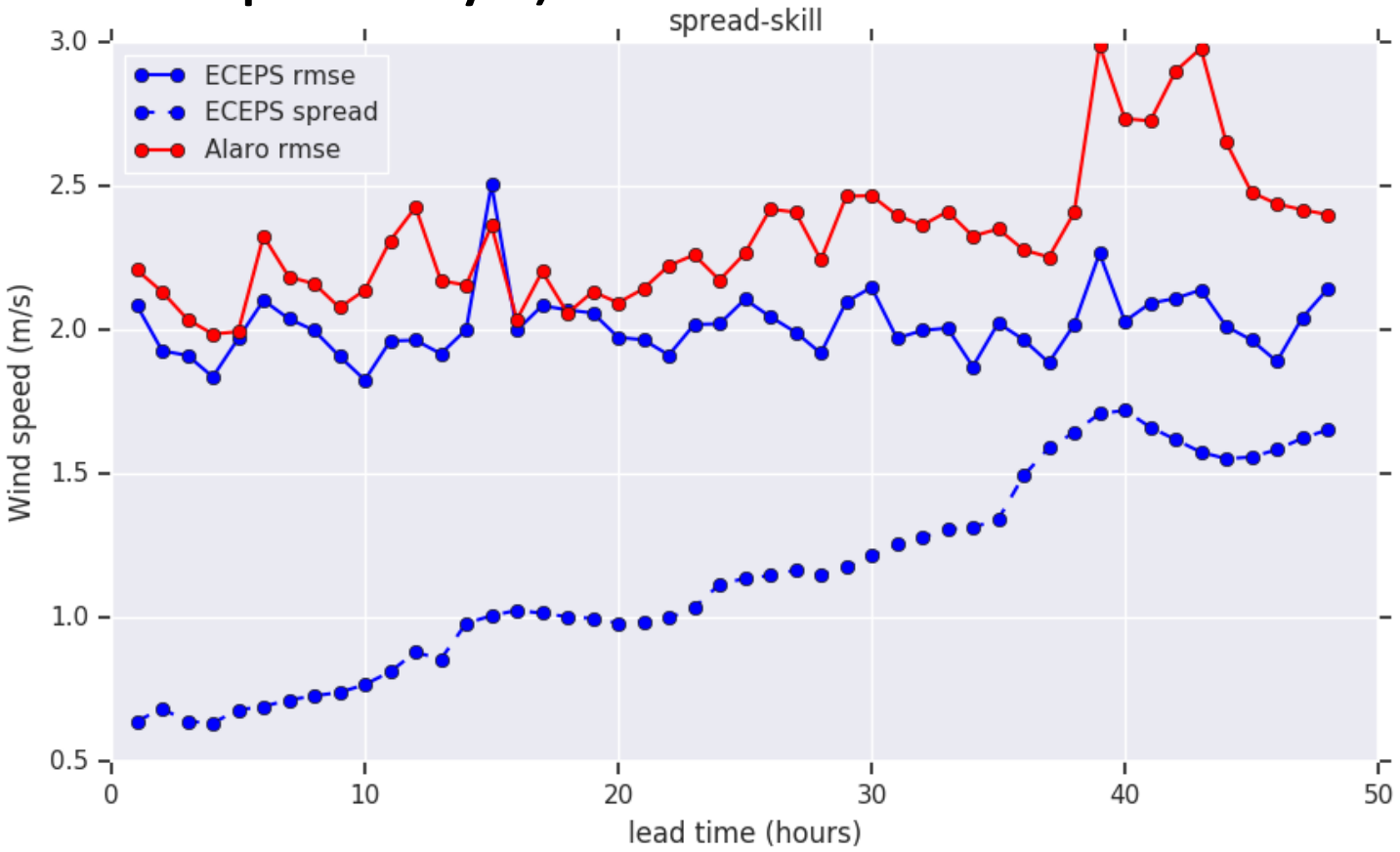
Application: wind energy

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



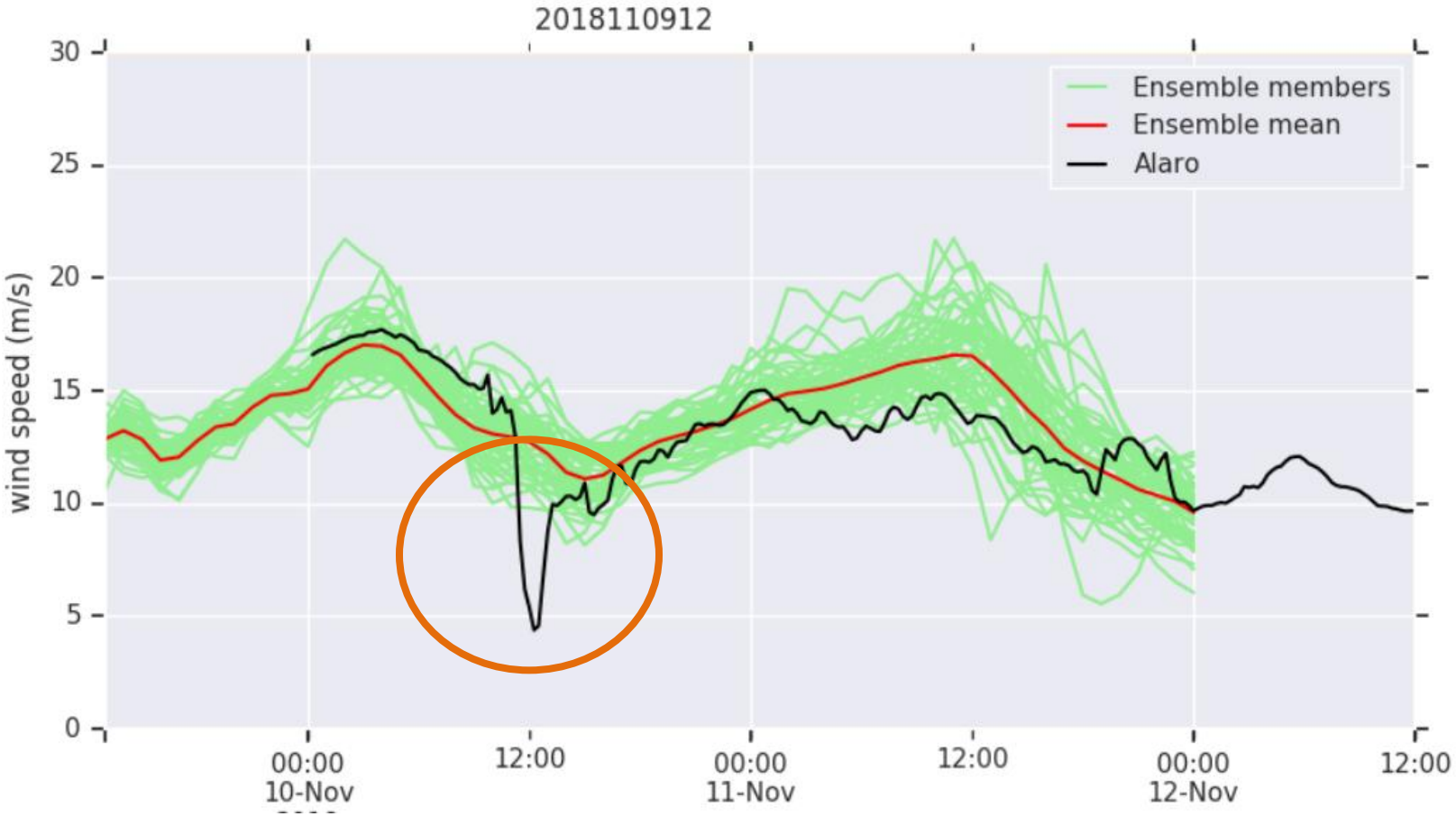
Application: wind energy

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



Application: wind energy

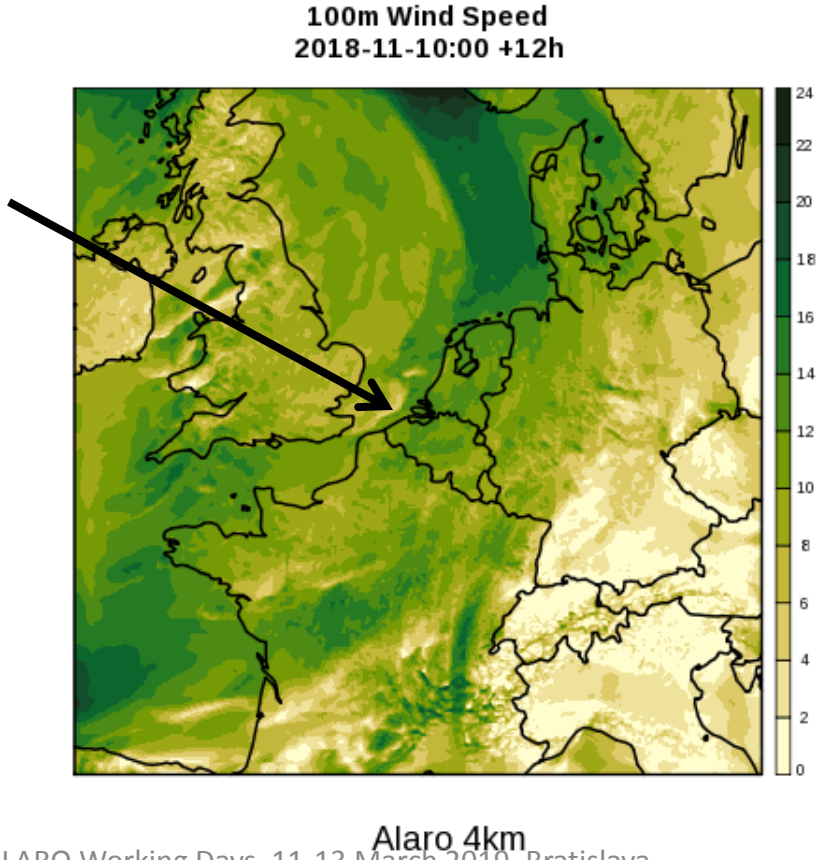
- Occasional sudden drop in ALARO wind speed

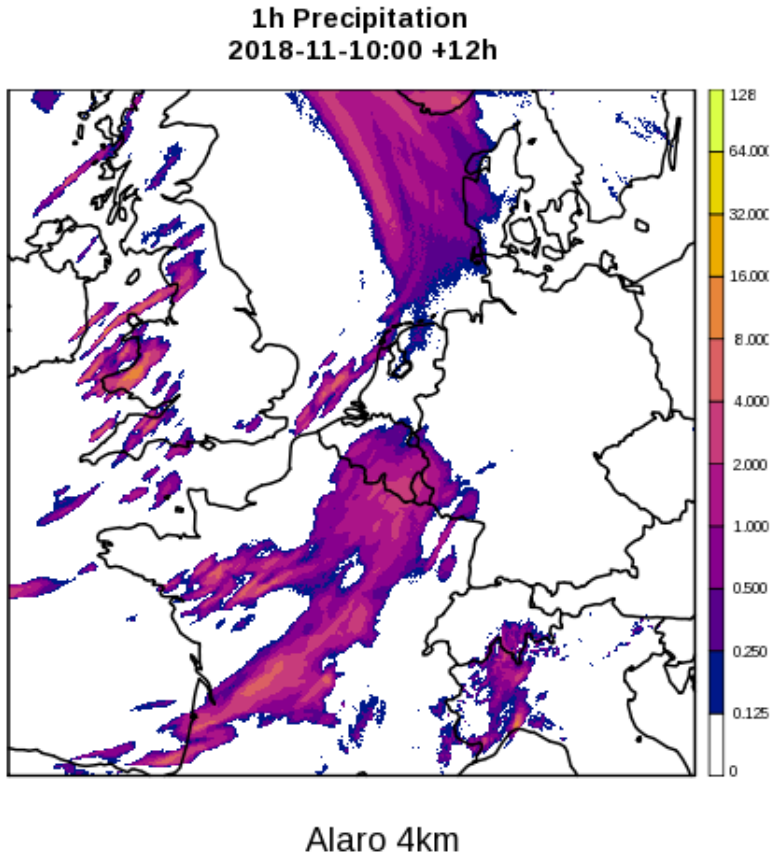


Note: 1h output of EC-EPS

Application: wind energy

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

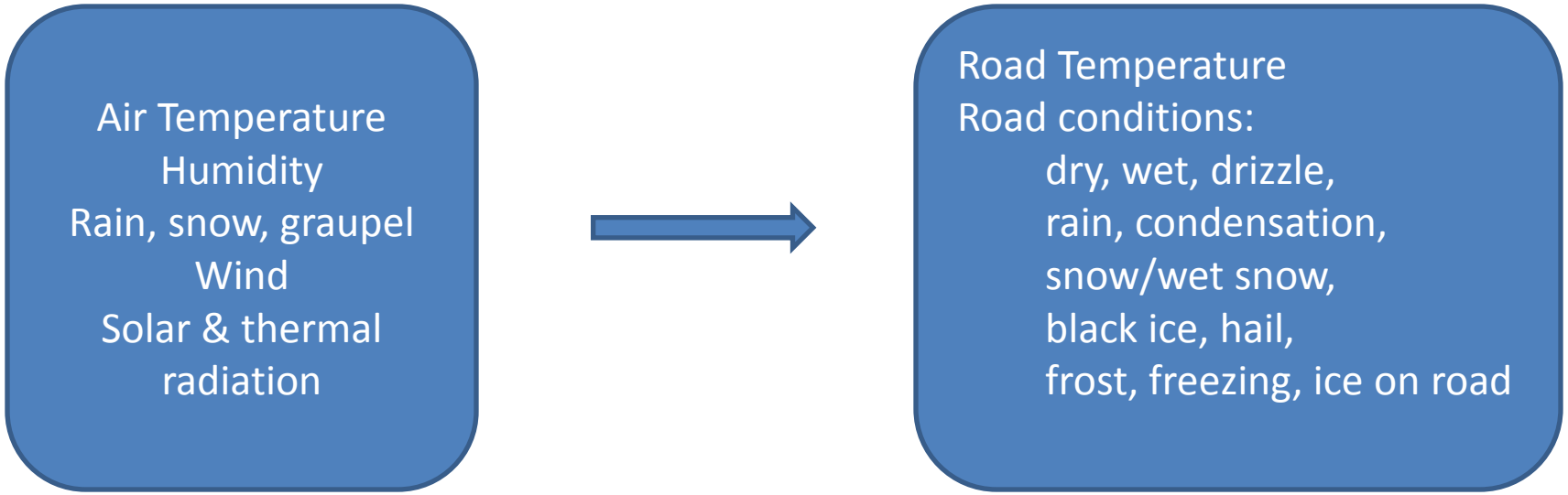




Application: road weather

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

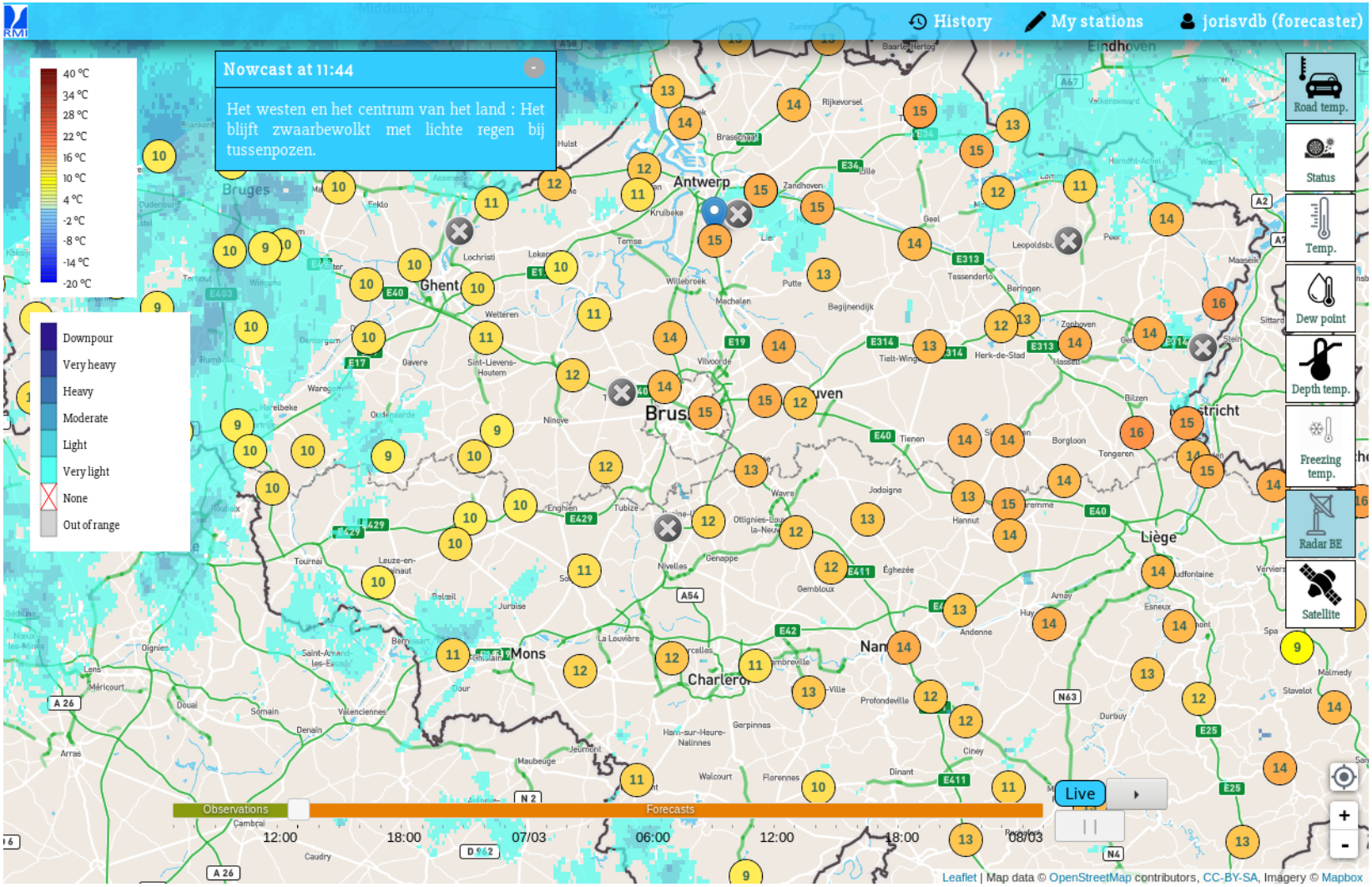
- Forcing KNMI road weather model (Karsisto et al., 2017) with RMI ALARO data:



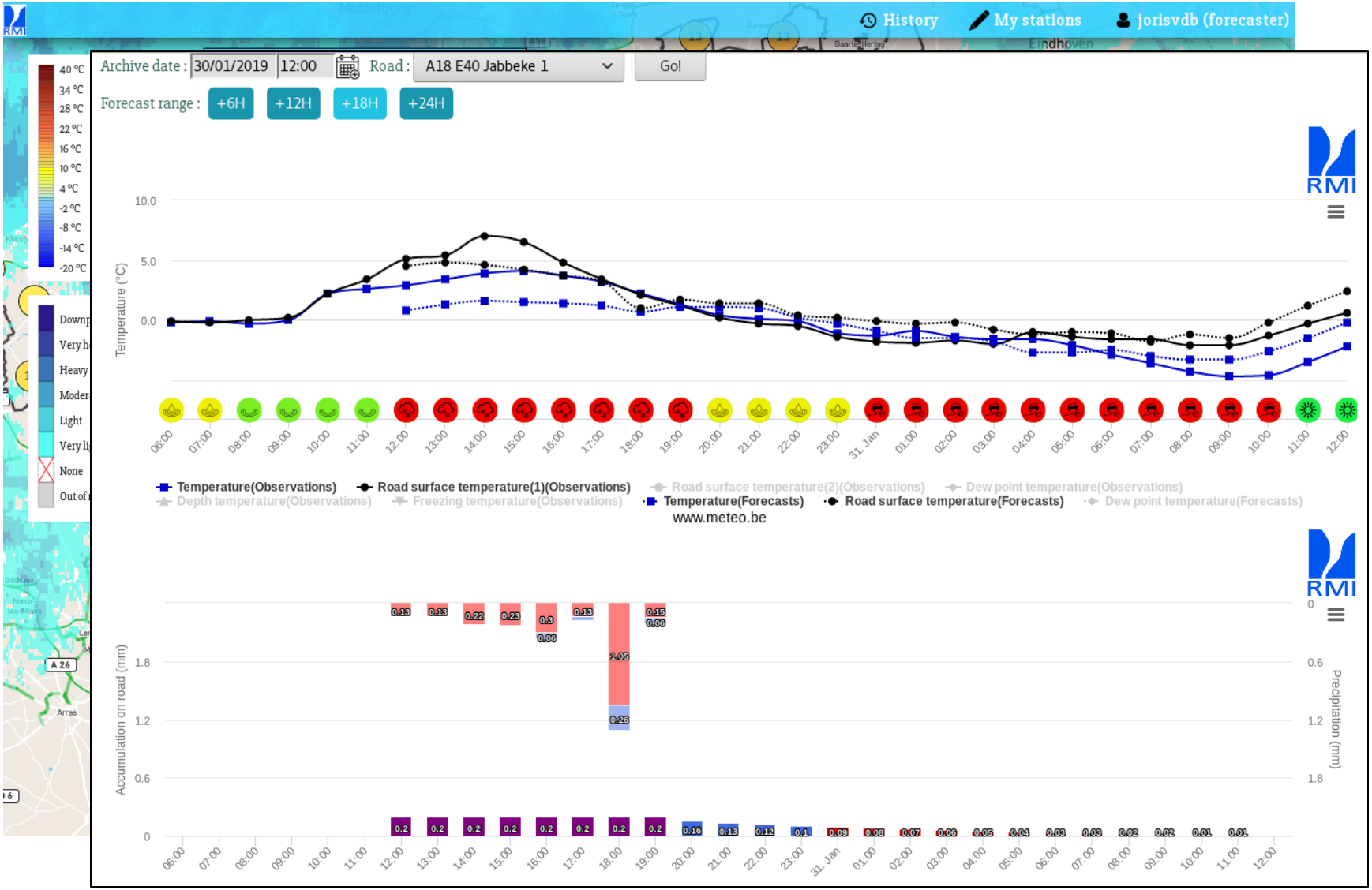
Application: road weather

- 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


Thank you!