

Evaluating representativeness errors in verification against Arctic surface observations

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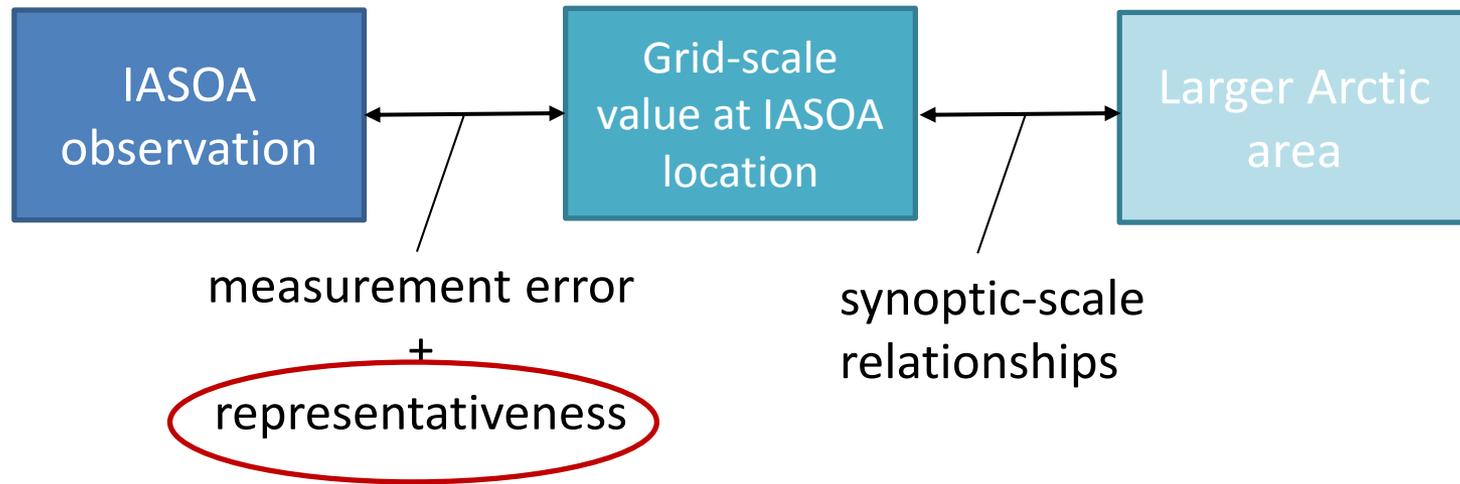
Outline

- **Arctic:** downward longwave radiation anomalies
- **Global:** 2-m temperature forecast skill

IASOA observatories

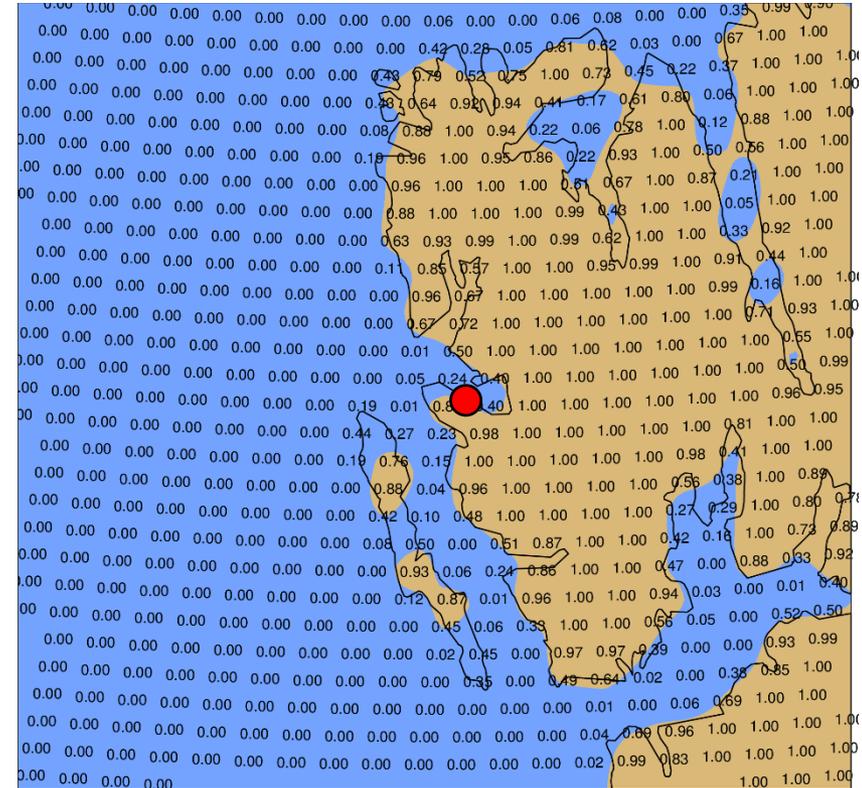
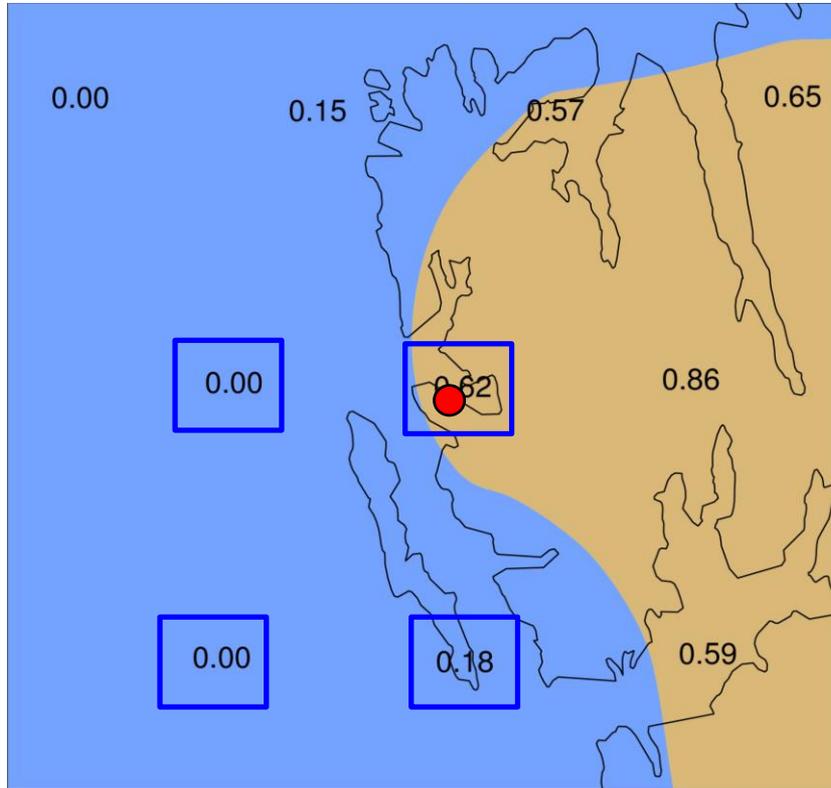


How much information about the larger Arctic area do IASOA observations contain?

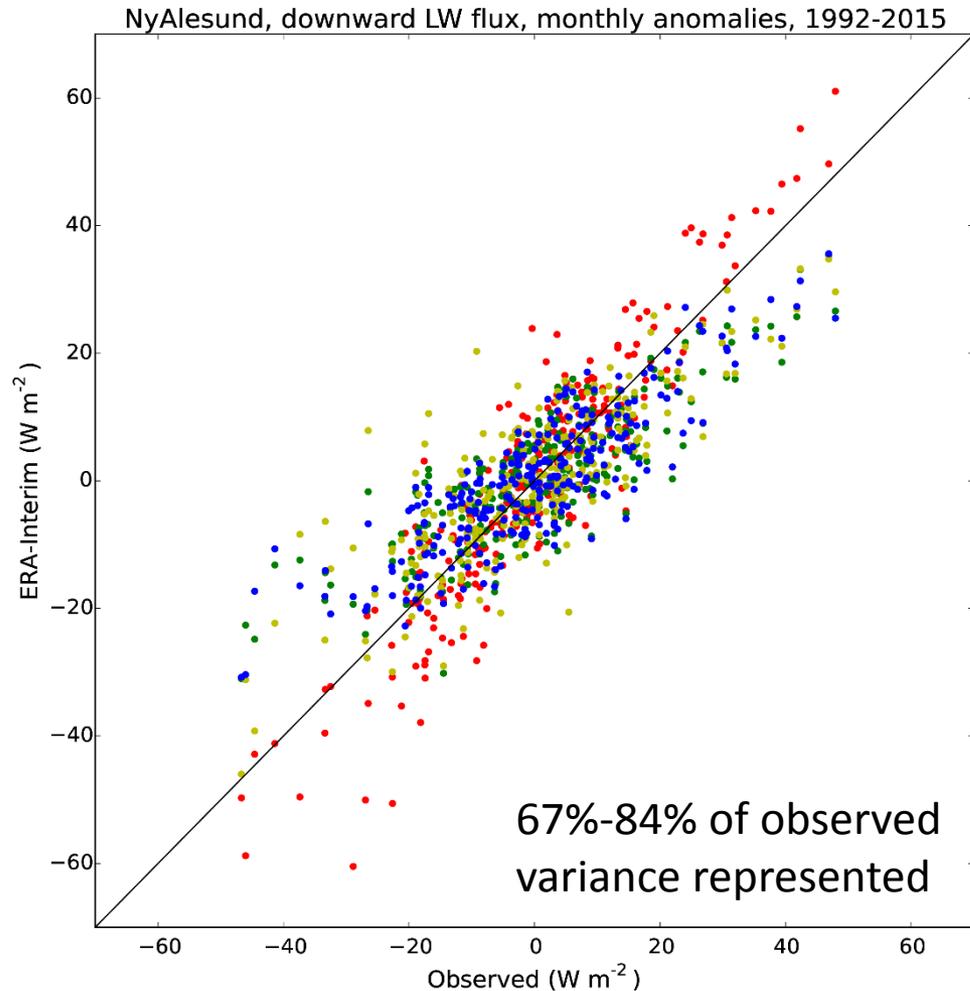


→ assess the spatial ‘footprint’ of IASOA observations using model analyses (ERA-Interim)

Example: Ny-Ålesund, Svalbard (79N,12E)



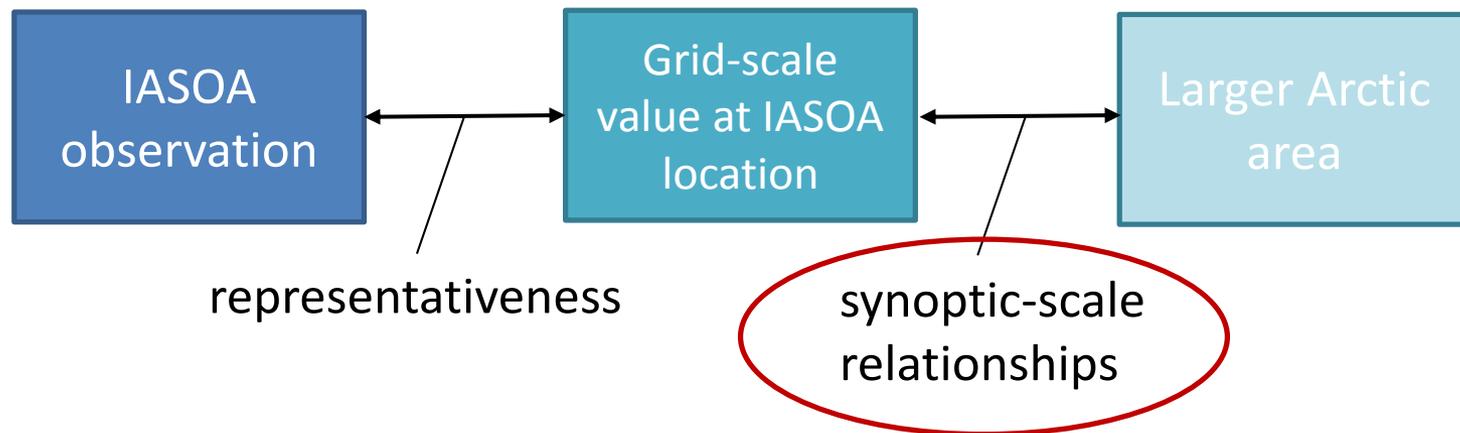
Downward longwave flux at Ny-Ålesund



Grid point	Land fraction	r
0	0.62	0.918
1	0.00	0.838
2	0.18	0.816
3	0.00	0.859

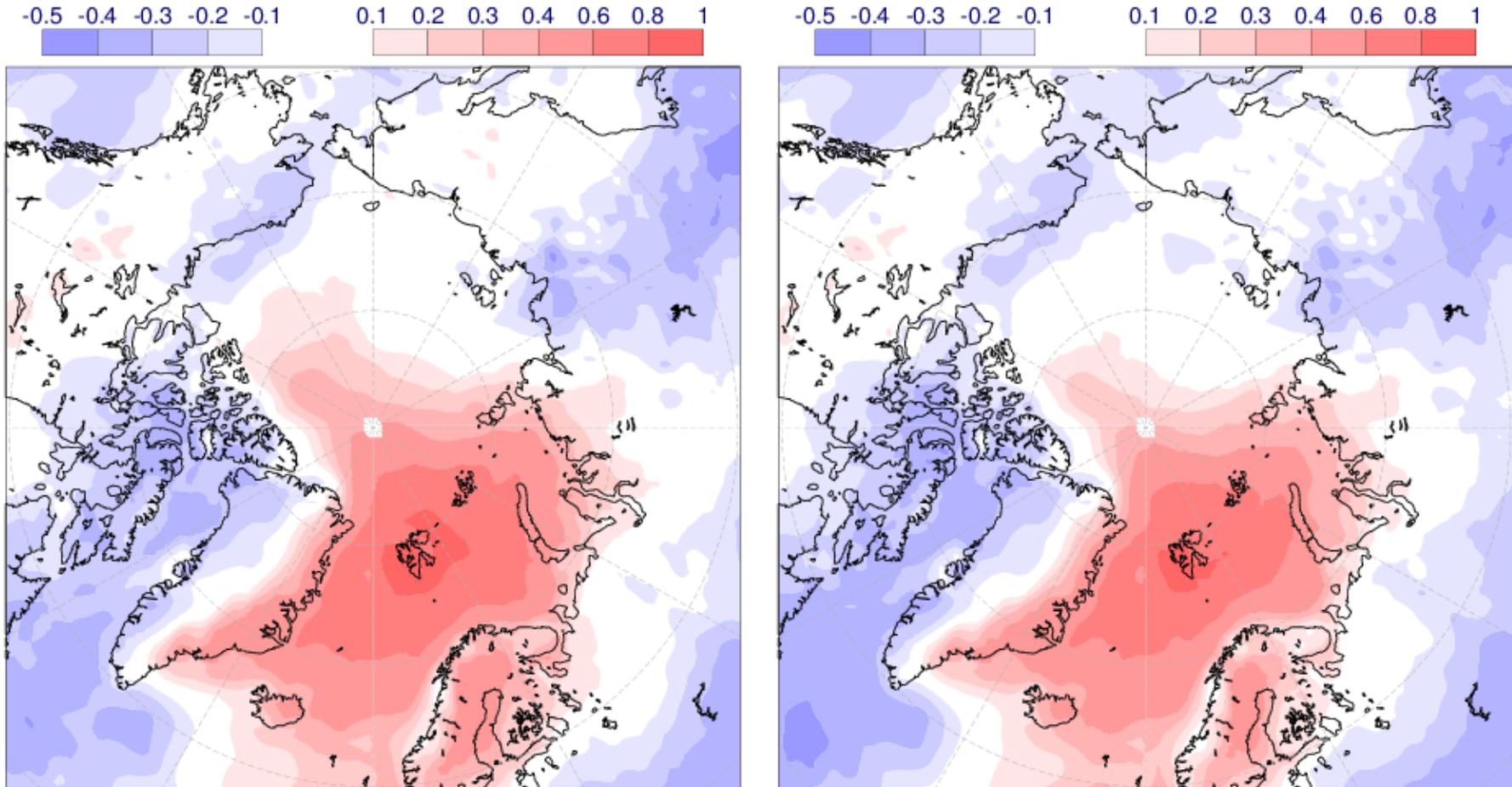
Systematic and non-systematic differences between grid-points

How much information about the larger Arctic area do IASOA observations contain?



→ assess the spatial ‘footprint’ of IASOA observations using model analyses (ERA-Interim)

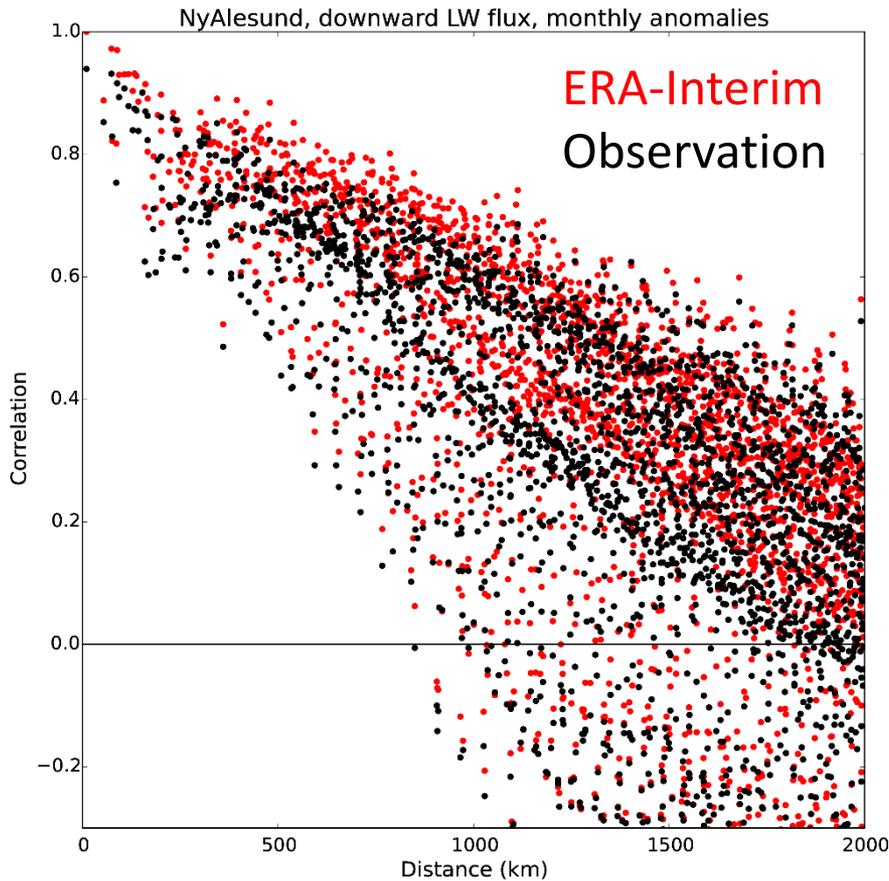
Spatial correlation of longwave flux at NyAlesund



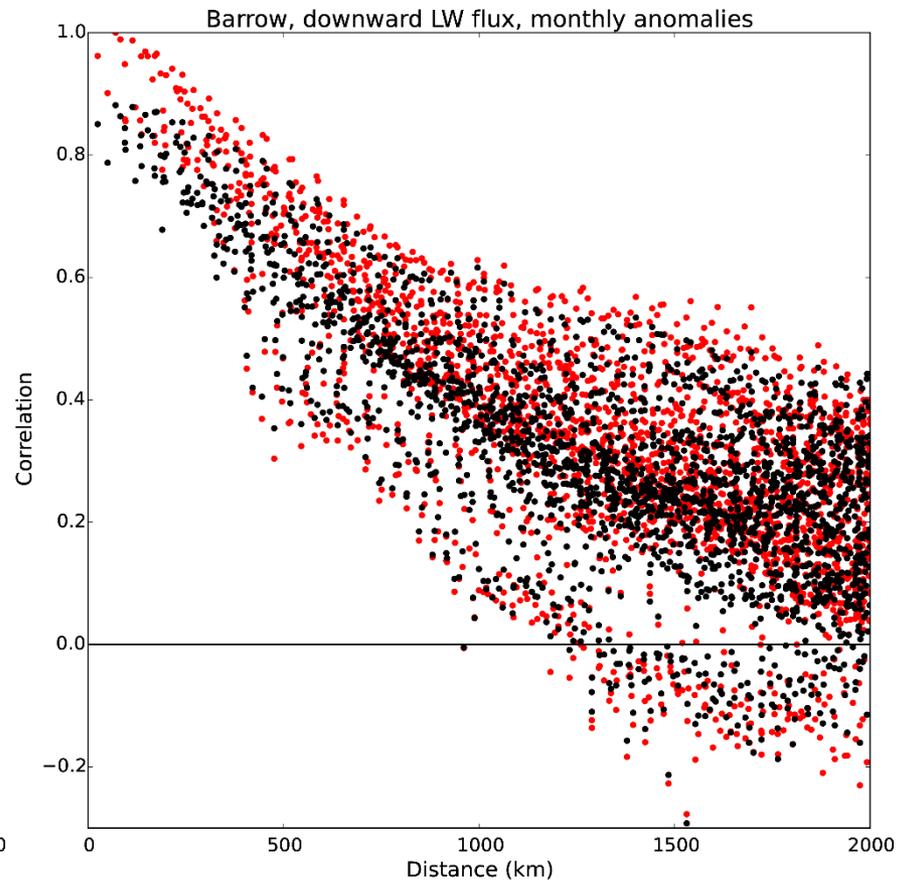
Correlation within ERA-Interim

Correlation OBS v ERA-Interim

Correlation as a function of distance

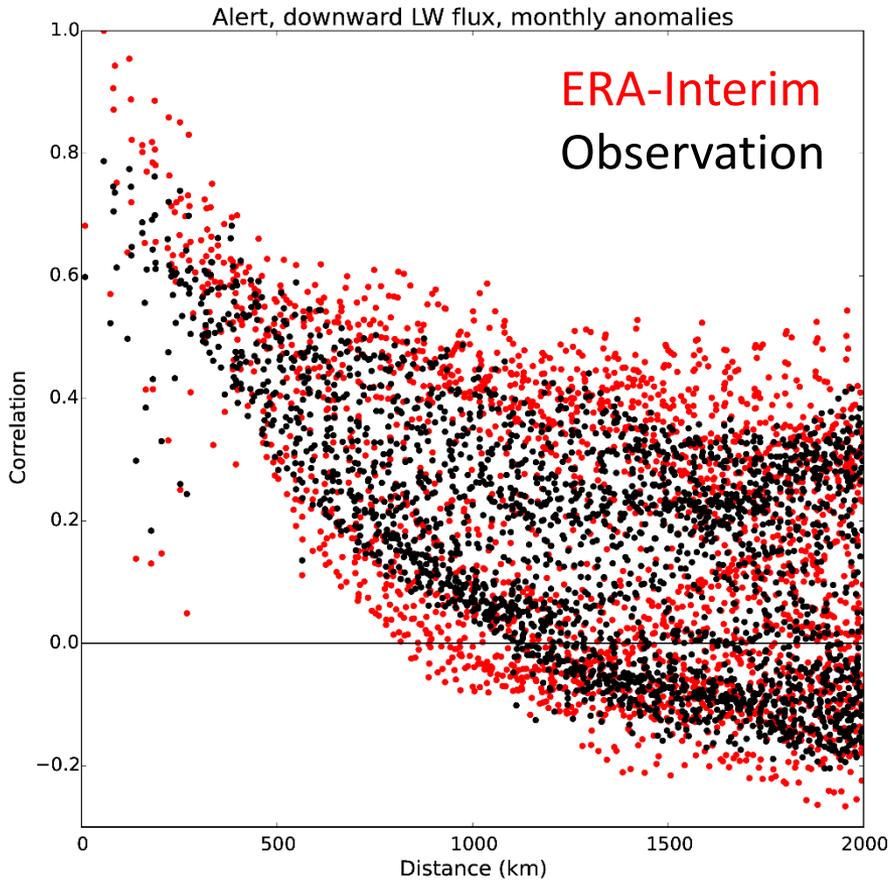


Ny-Ålesund

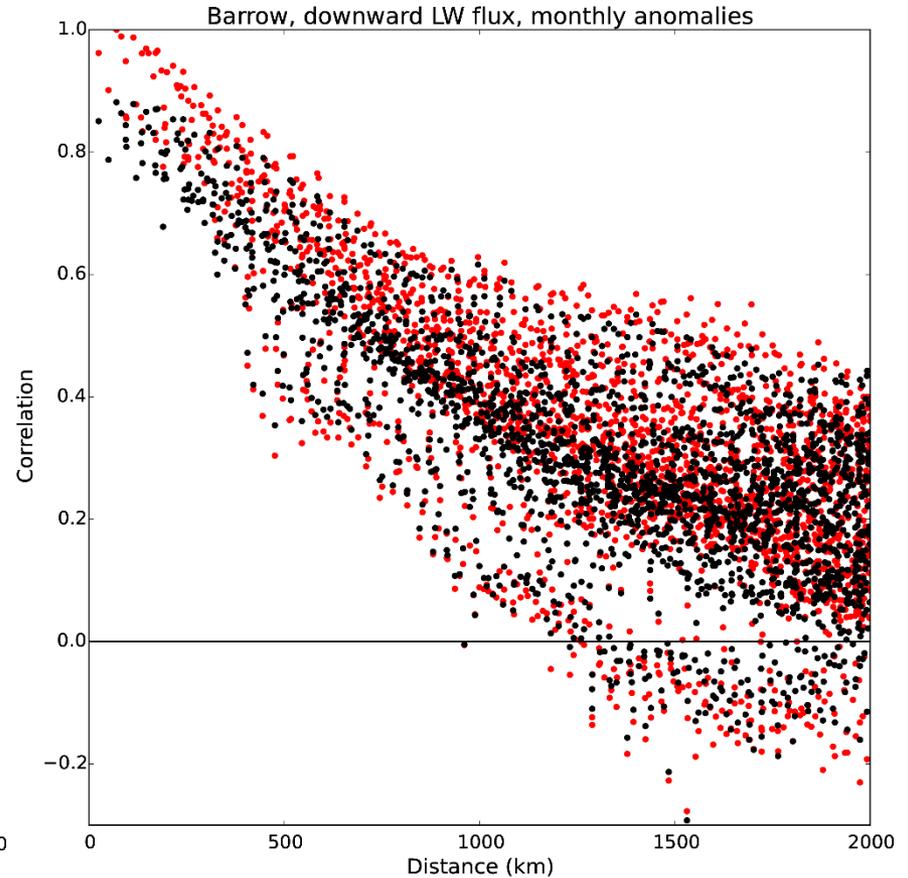


Barrow

Correlation as a function of distance

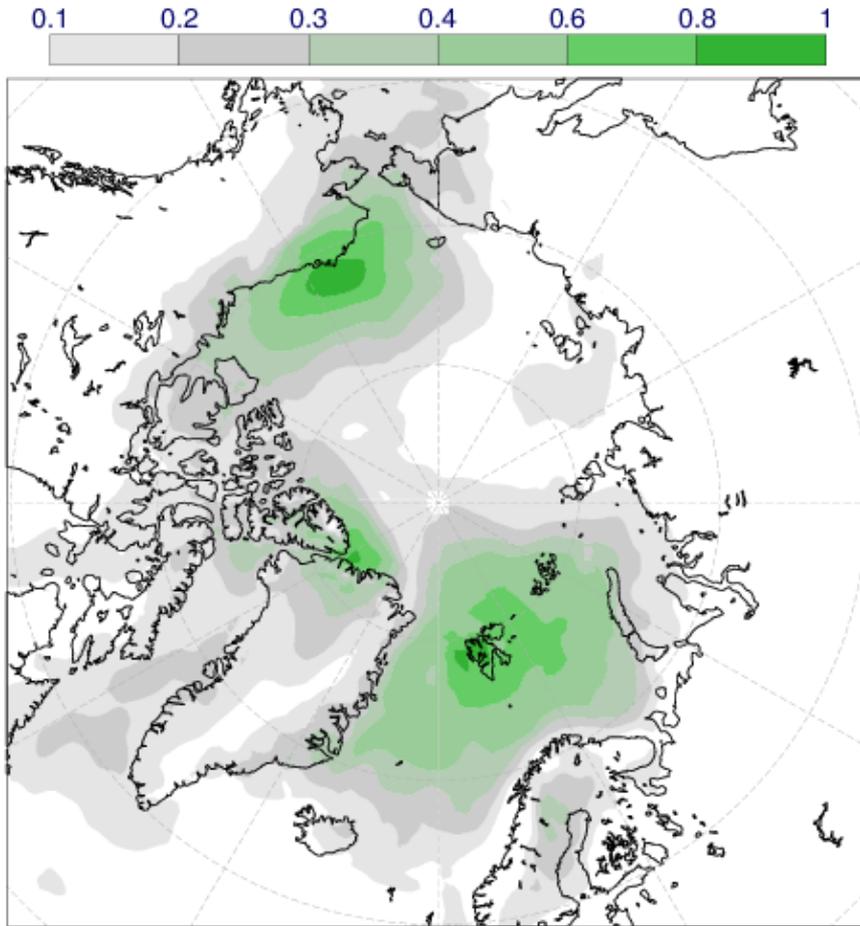


Alert

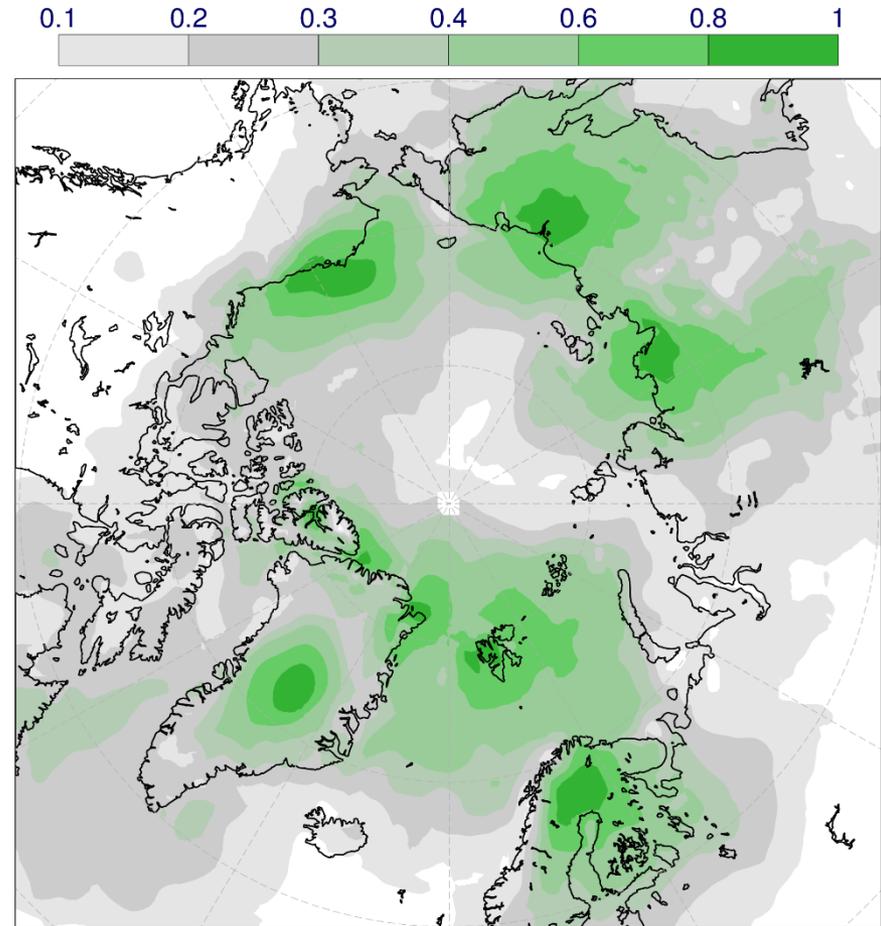


Barrow

Variance explained by positive correlations

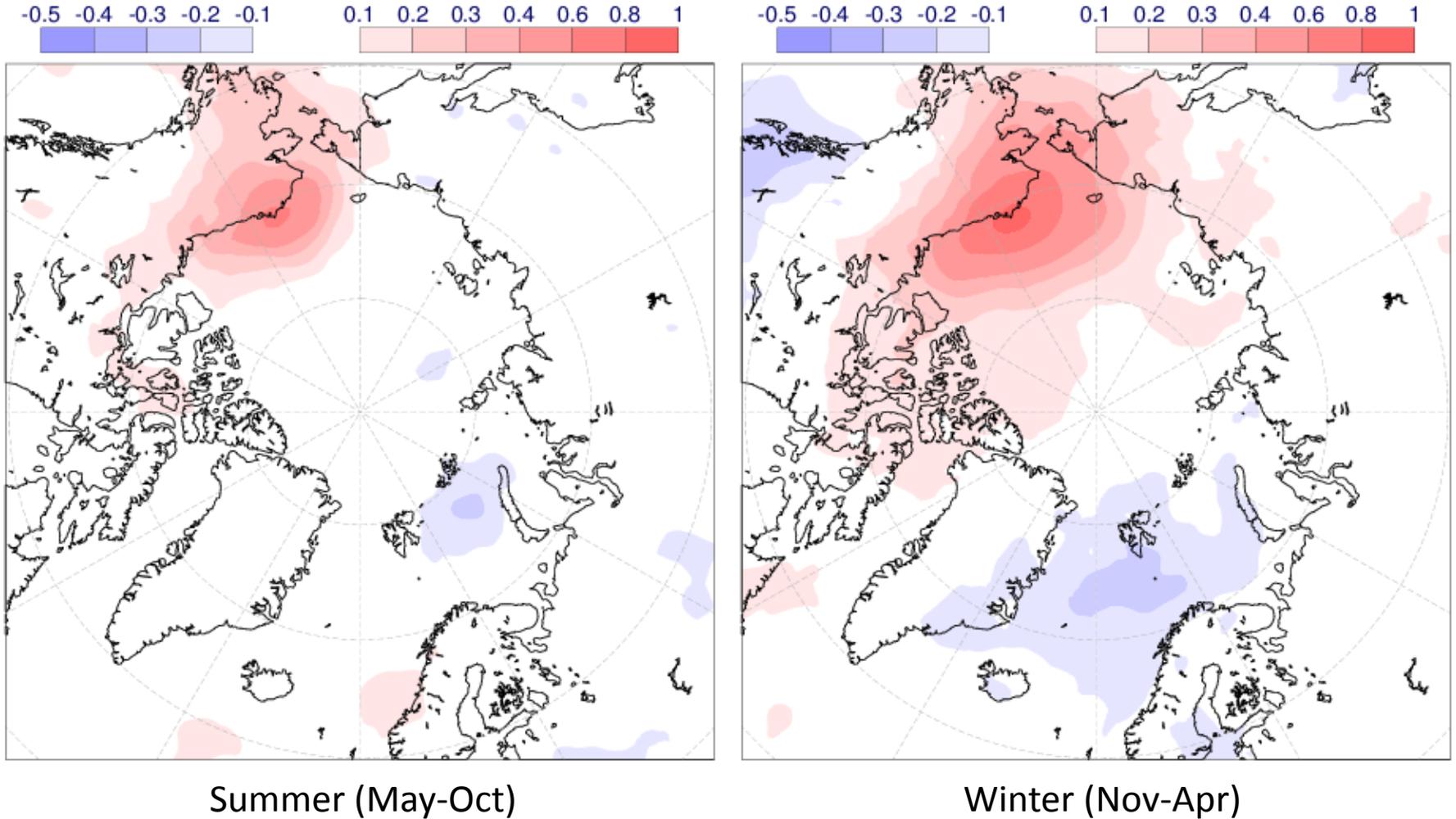


Barrow, Alert, Ny-Alesund

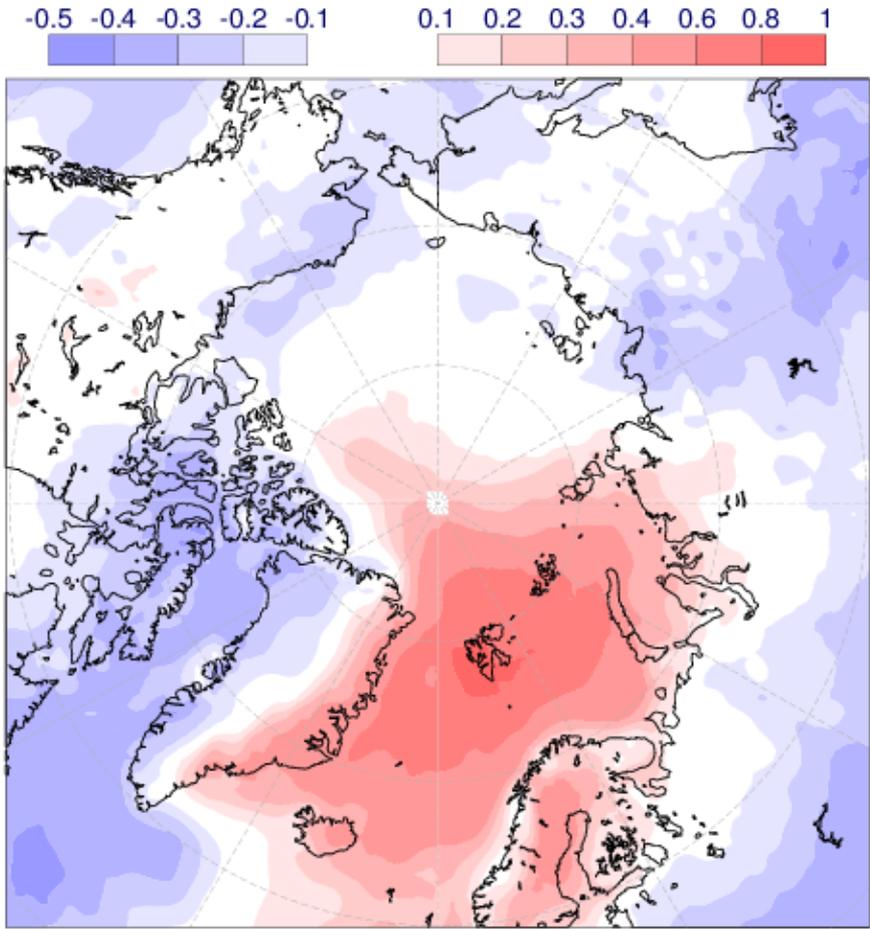


All IASOA stations

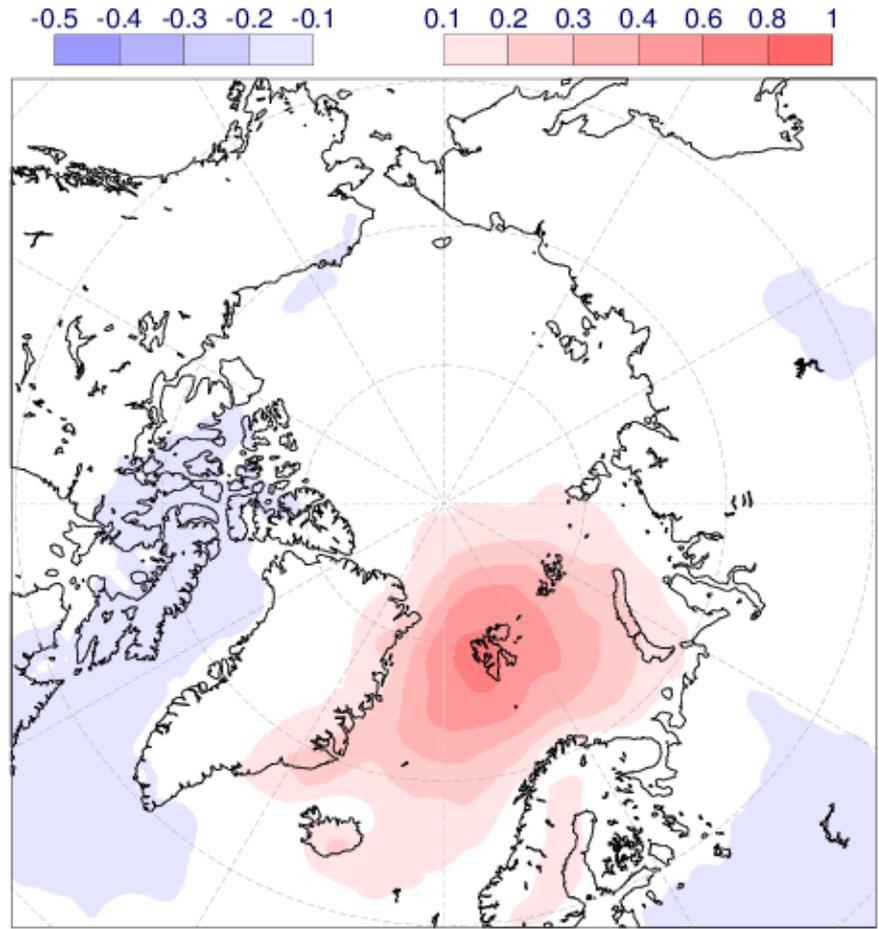
Longwave flux at Barrow OBS v ERA-I



Longwave flux at NyAlesund OBS v ERA-I

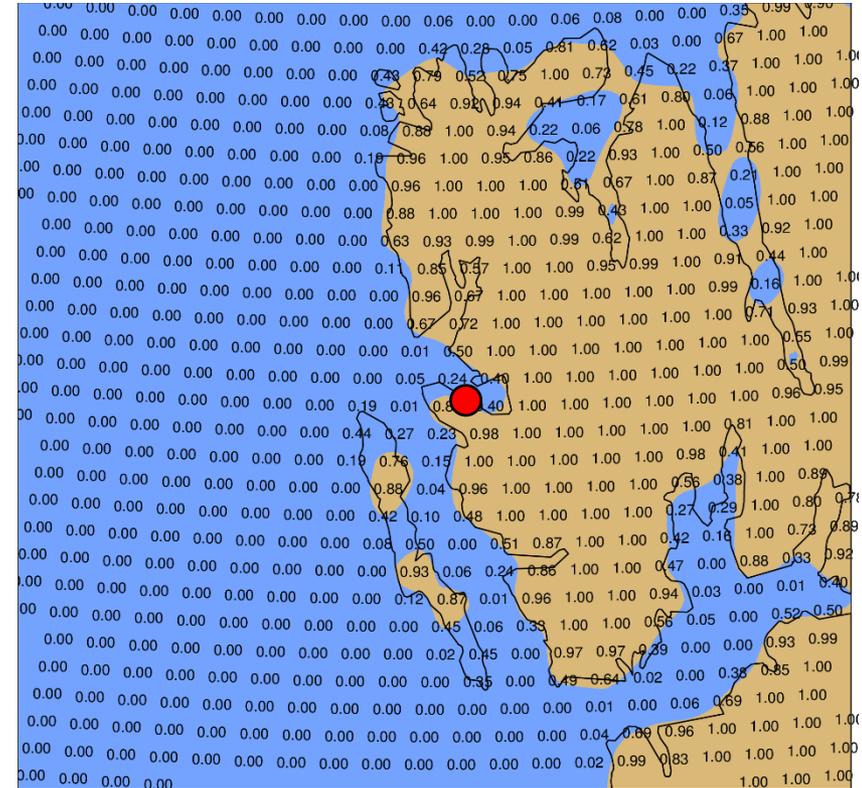
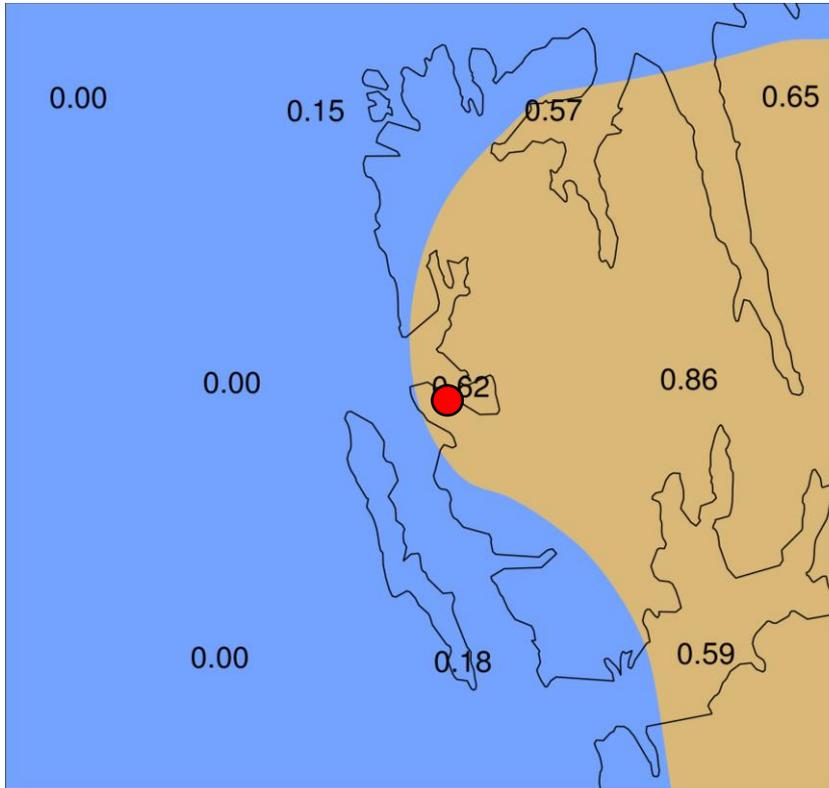


Monthly



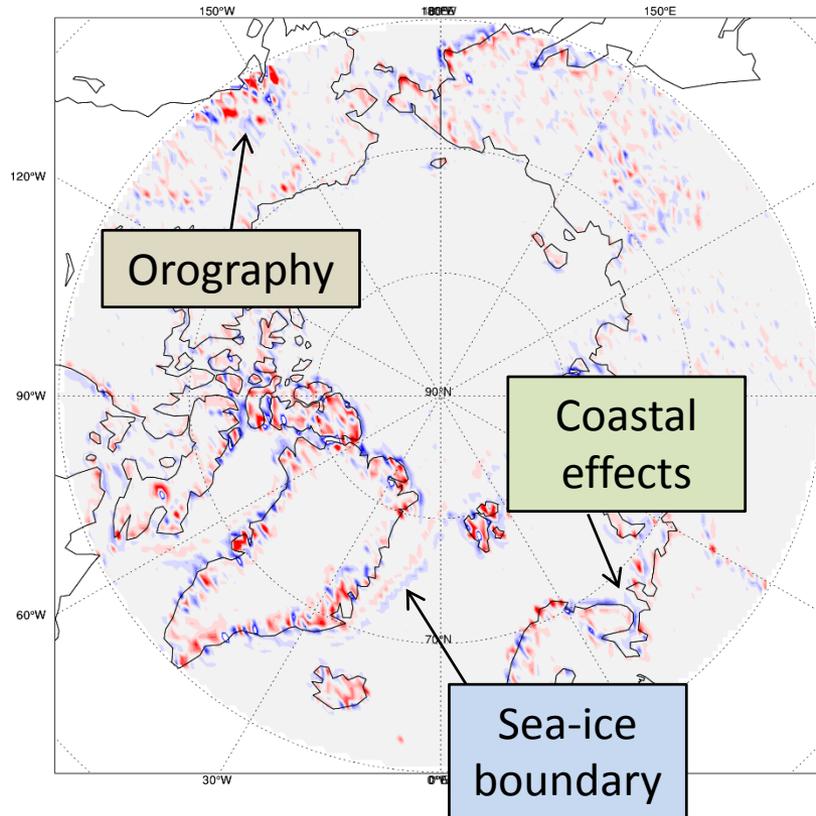
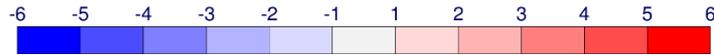
Daily

Ny-Ålesund, Svalbard (79N,12E)



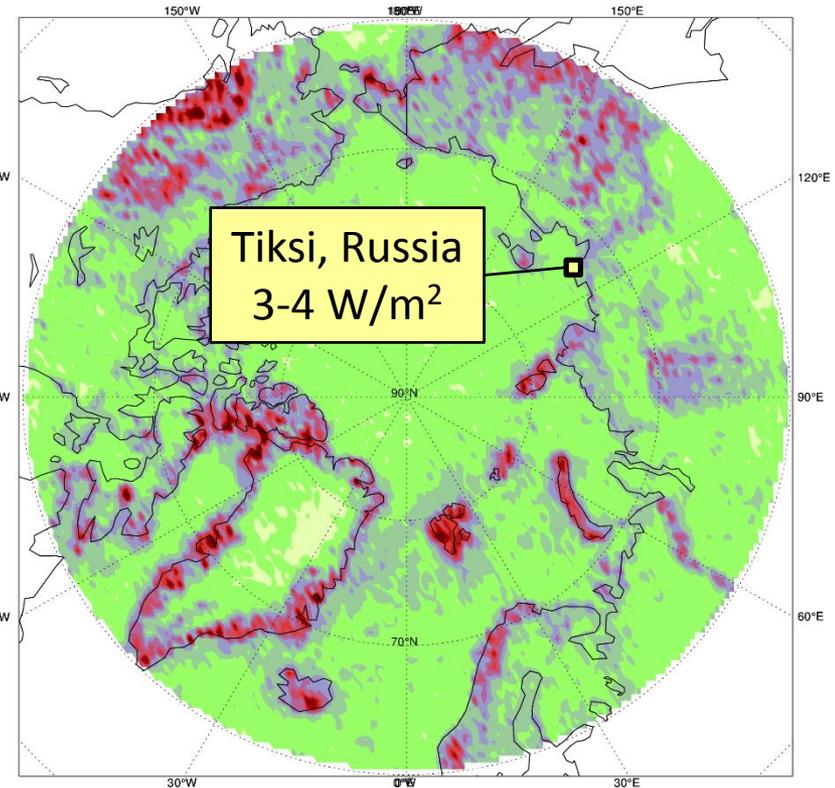
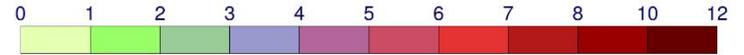
Representativeness of daily DLR (Jan 2017)

24-h DLR representativeness: ME 80km v 9km (W/m²)



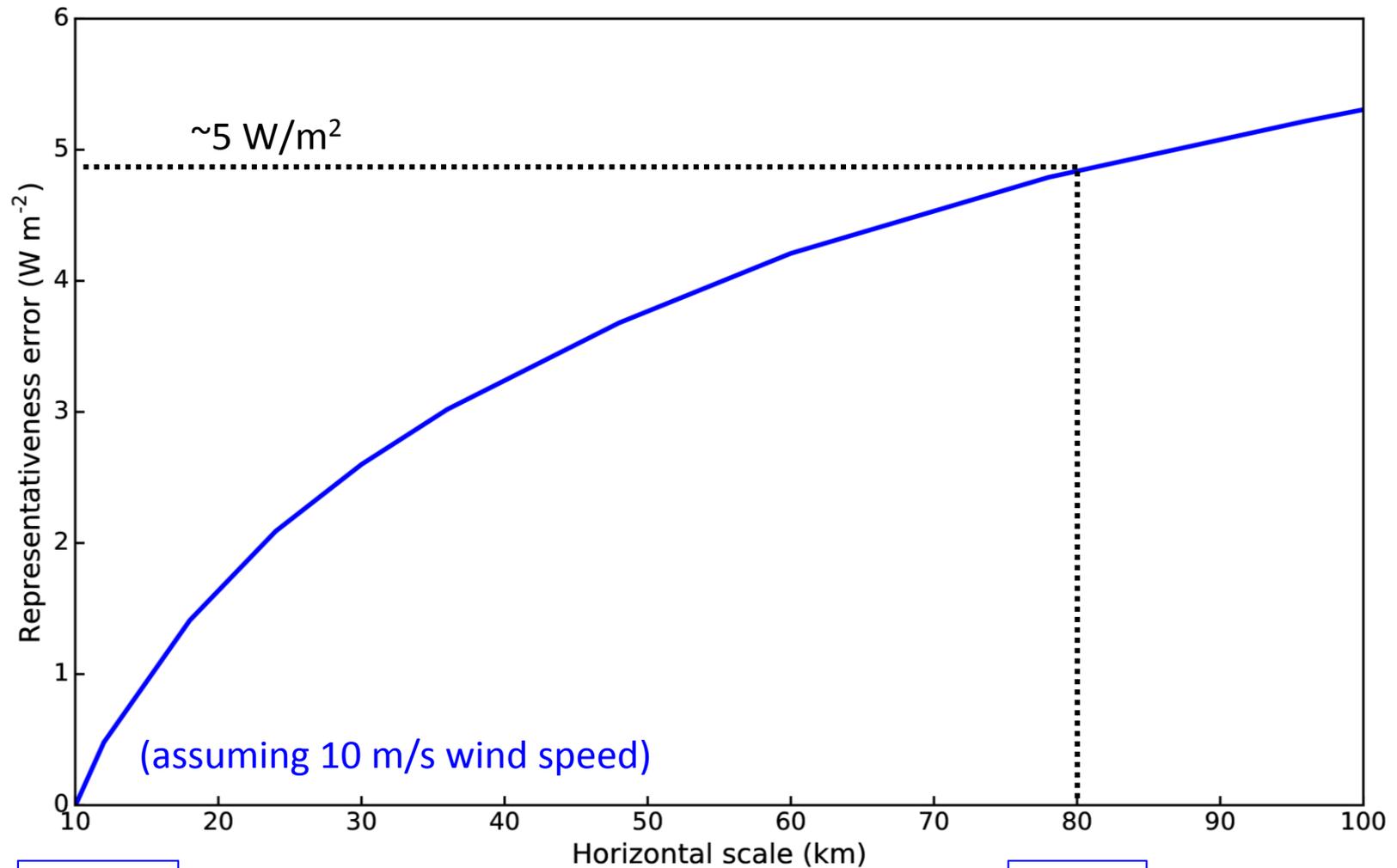
Bias

24-h DLR representativeness: SDEV 80km v 9km (W/m²)



Standard deviation

Estimation based on Taylor hypothesis

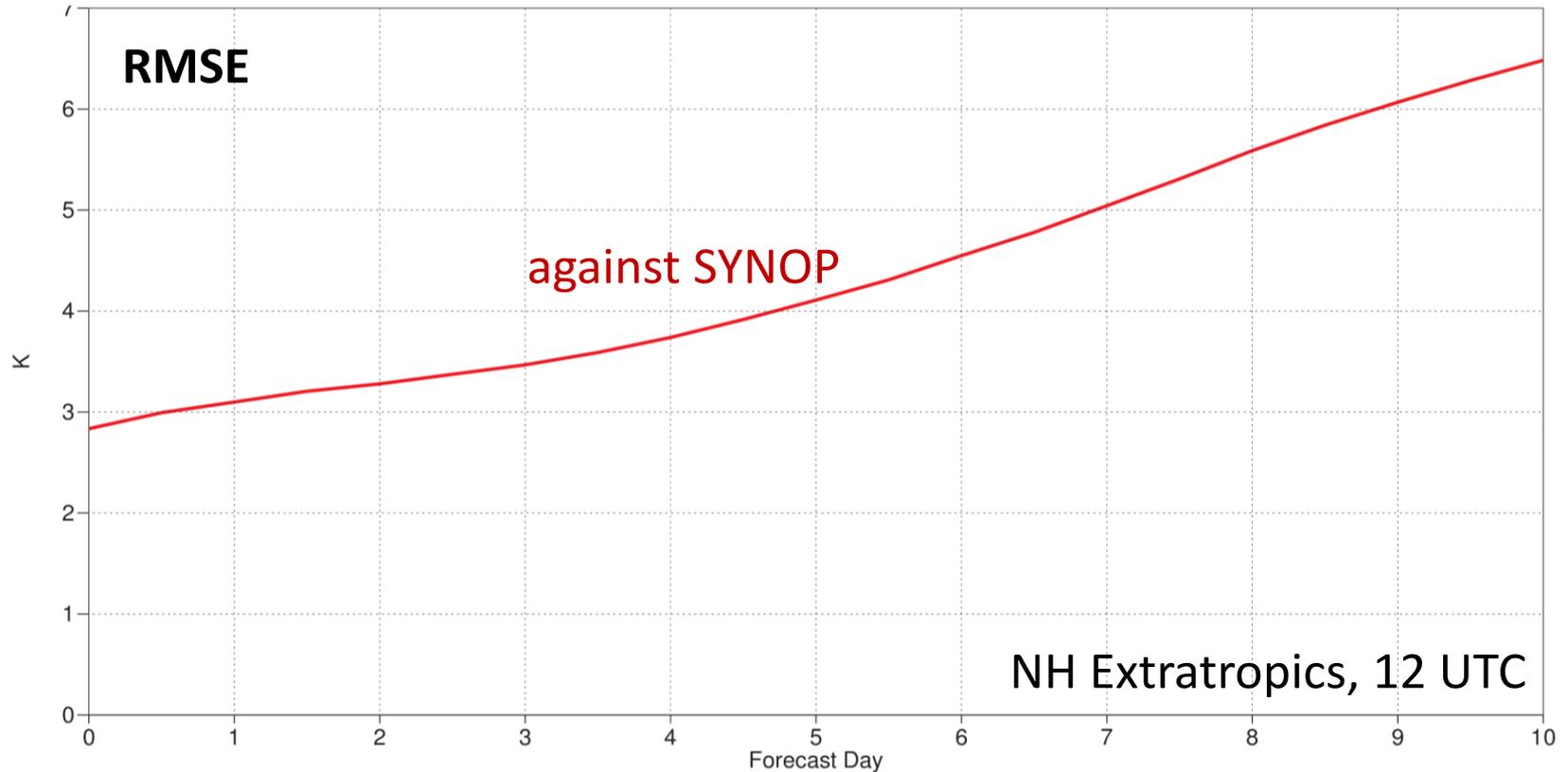


16 min

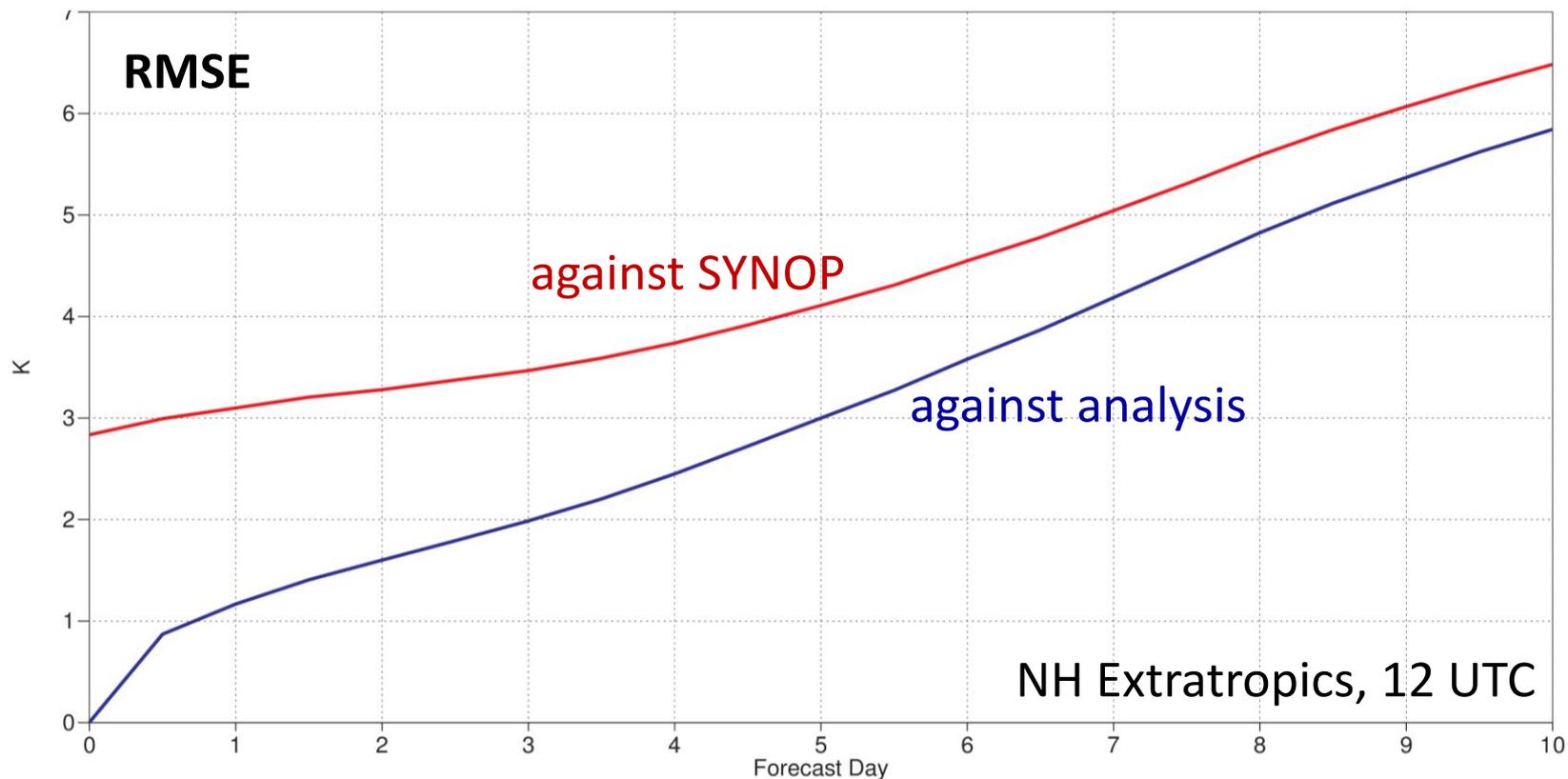
2 h

2-m temperature

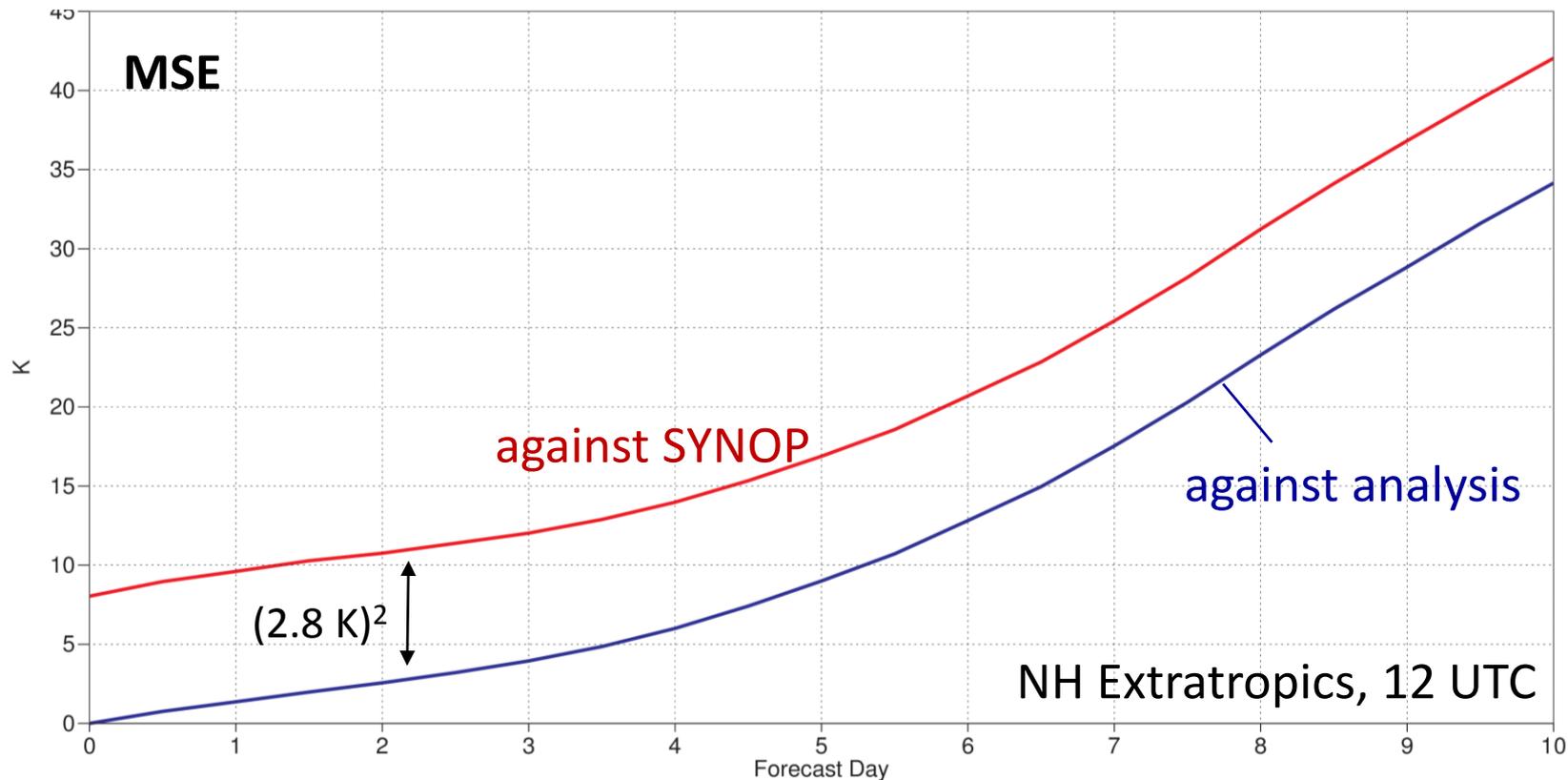
2-m temperature verification



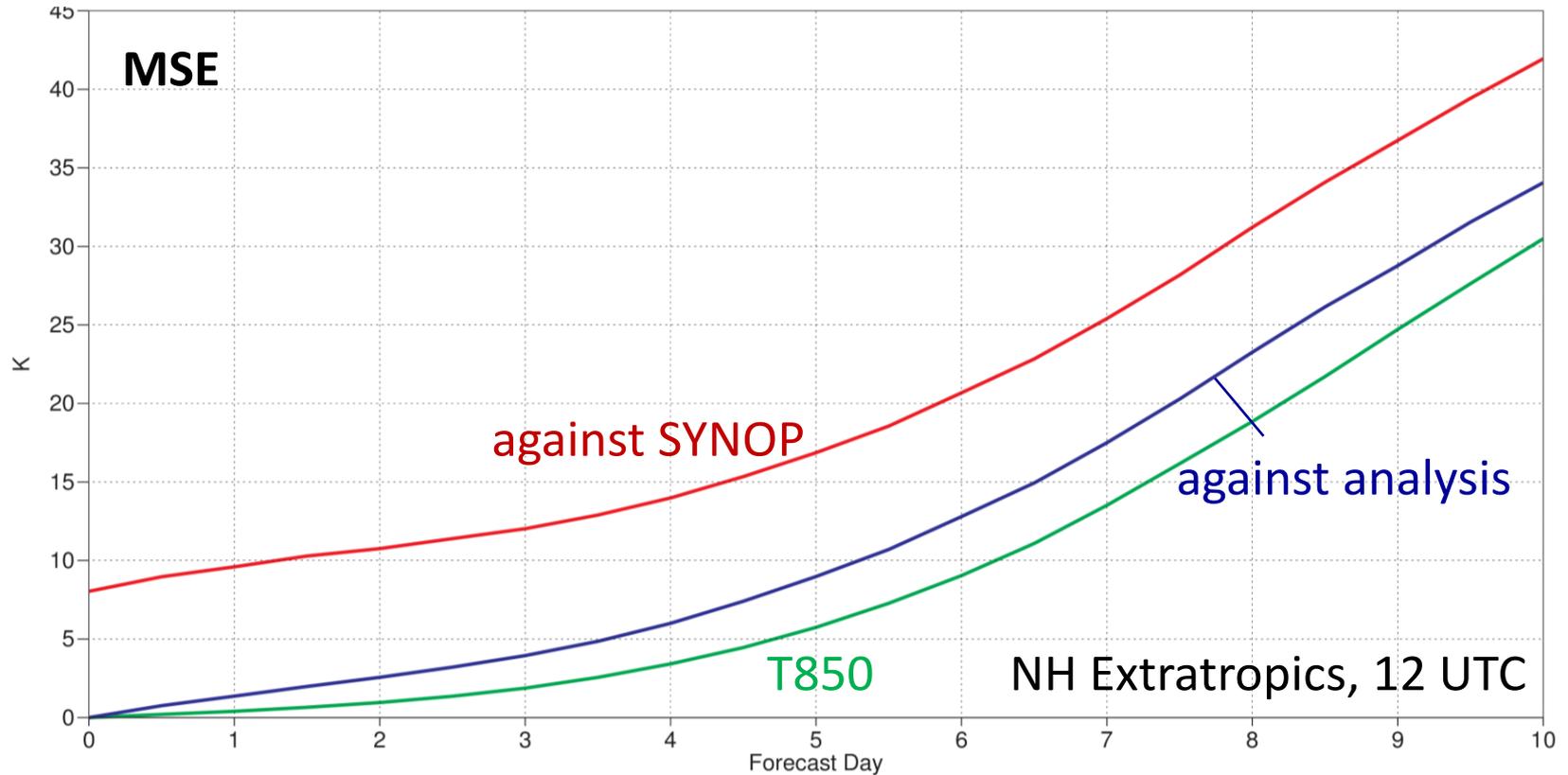
2-m temperature verification



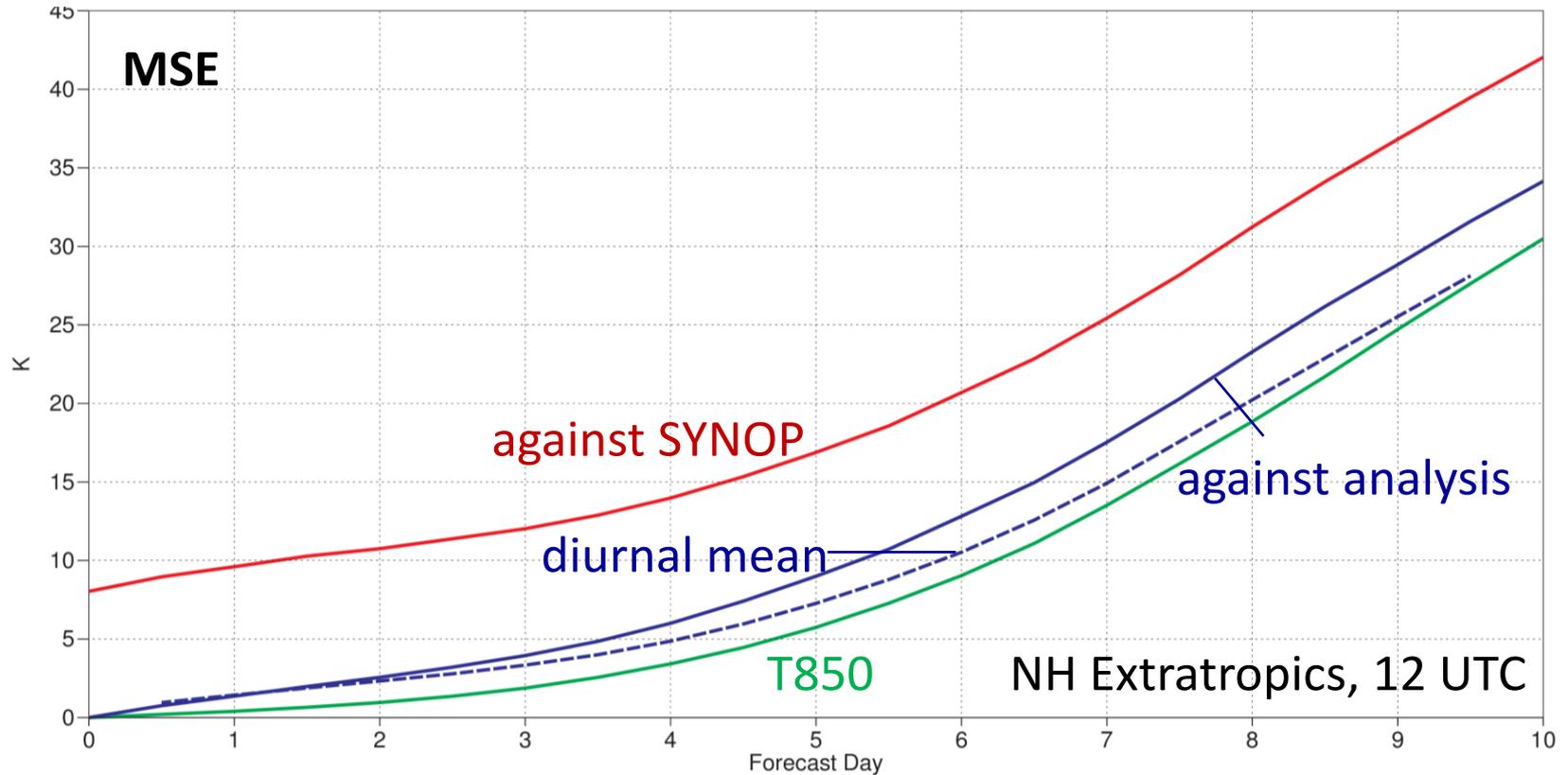
2-m temperature verification



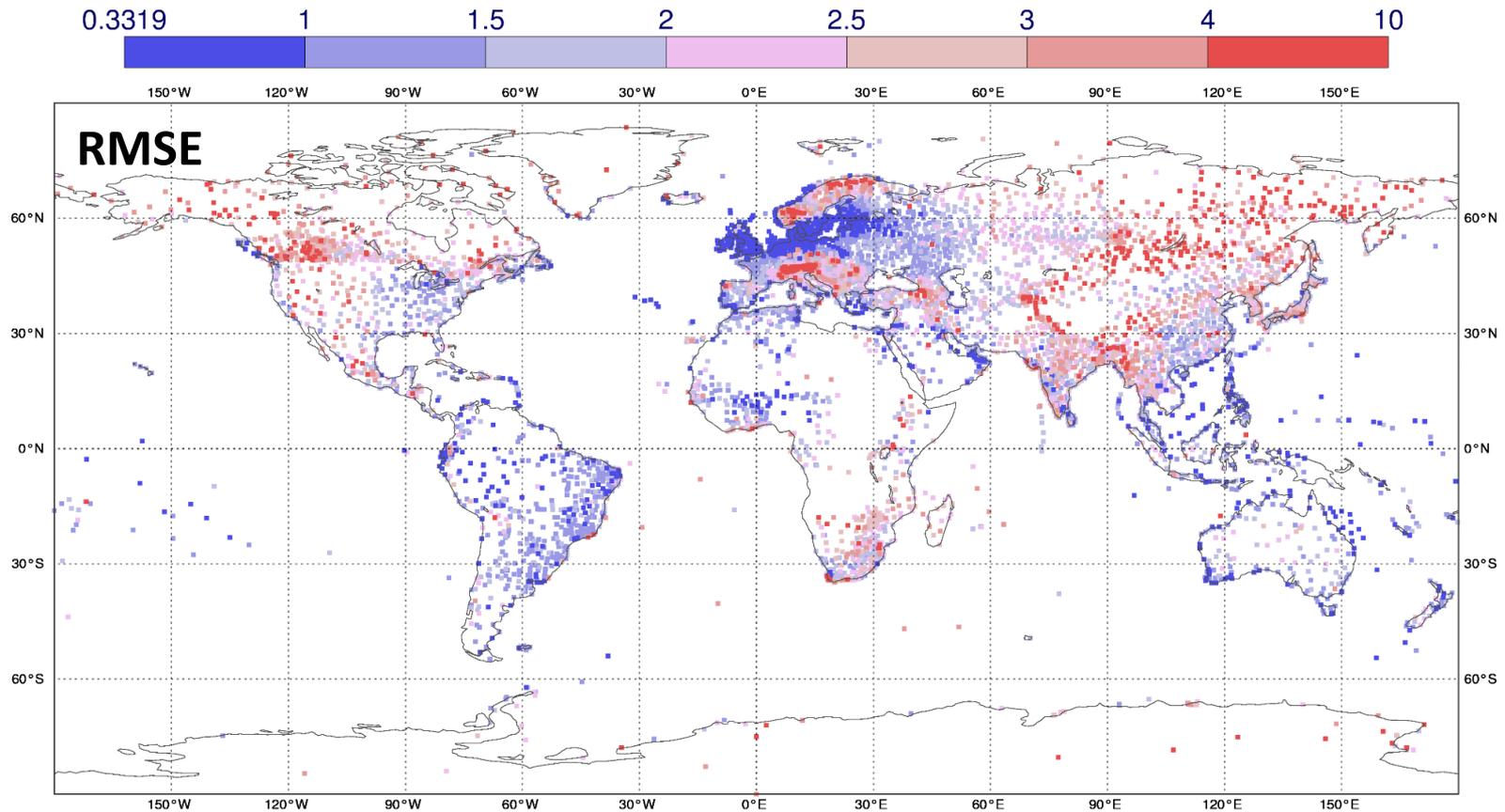
2-m temperature verification



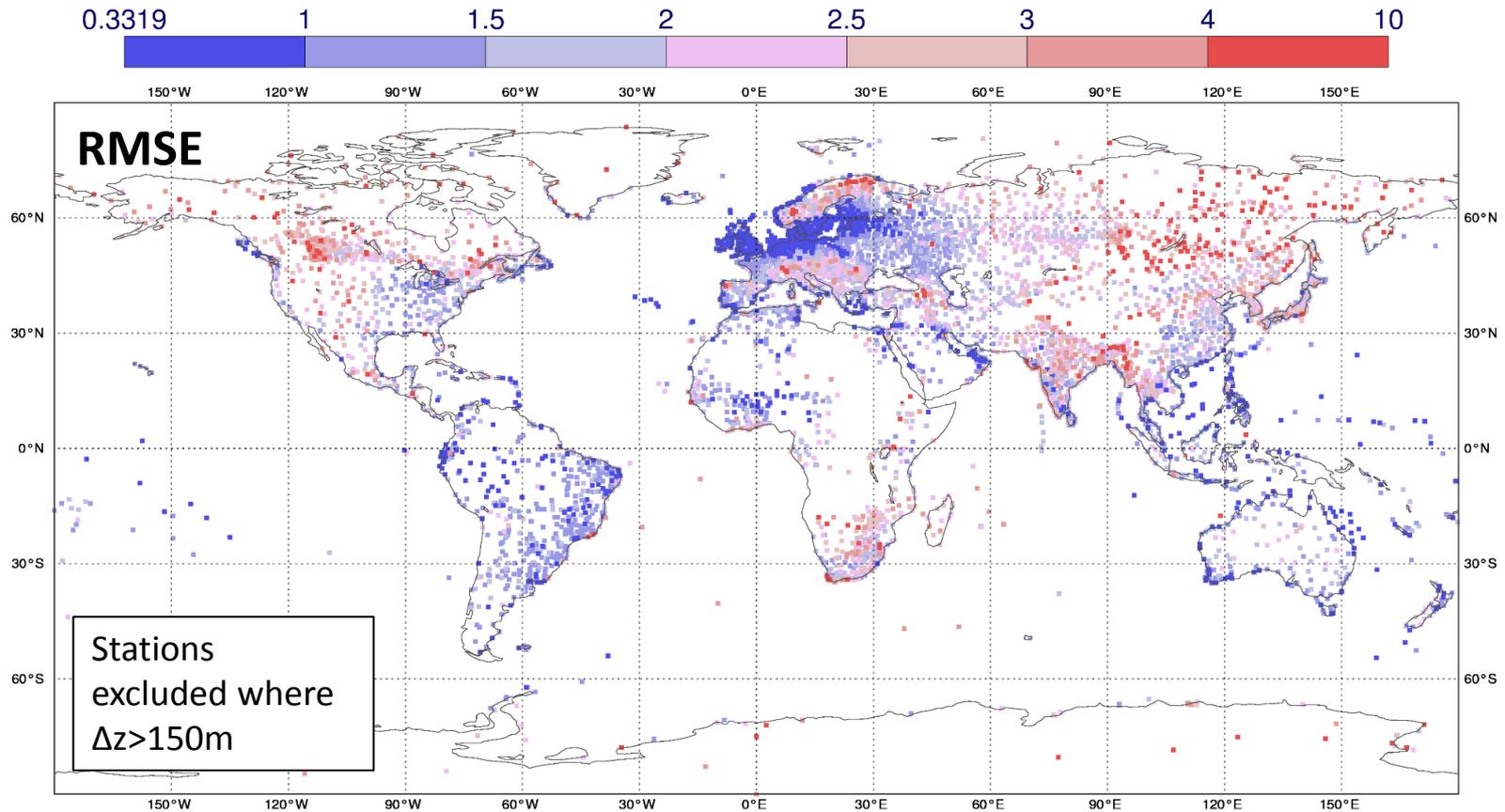
2-m temperature verification



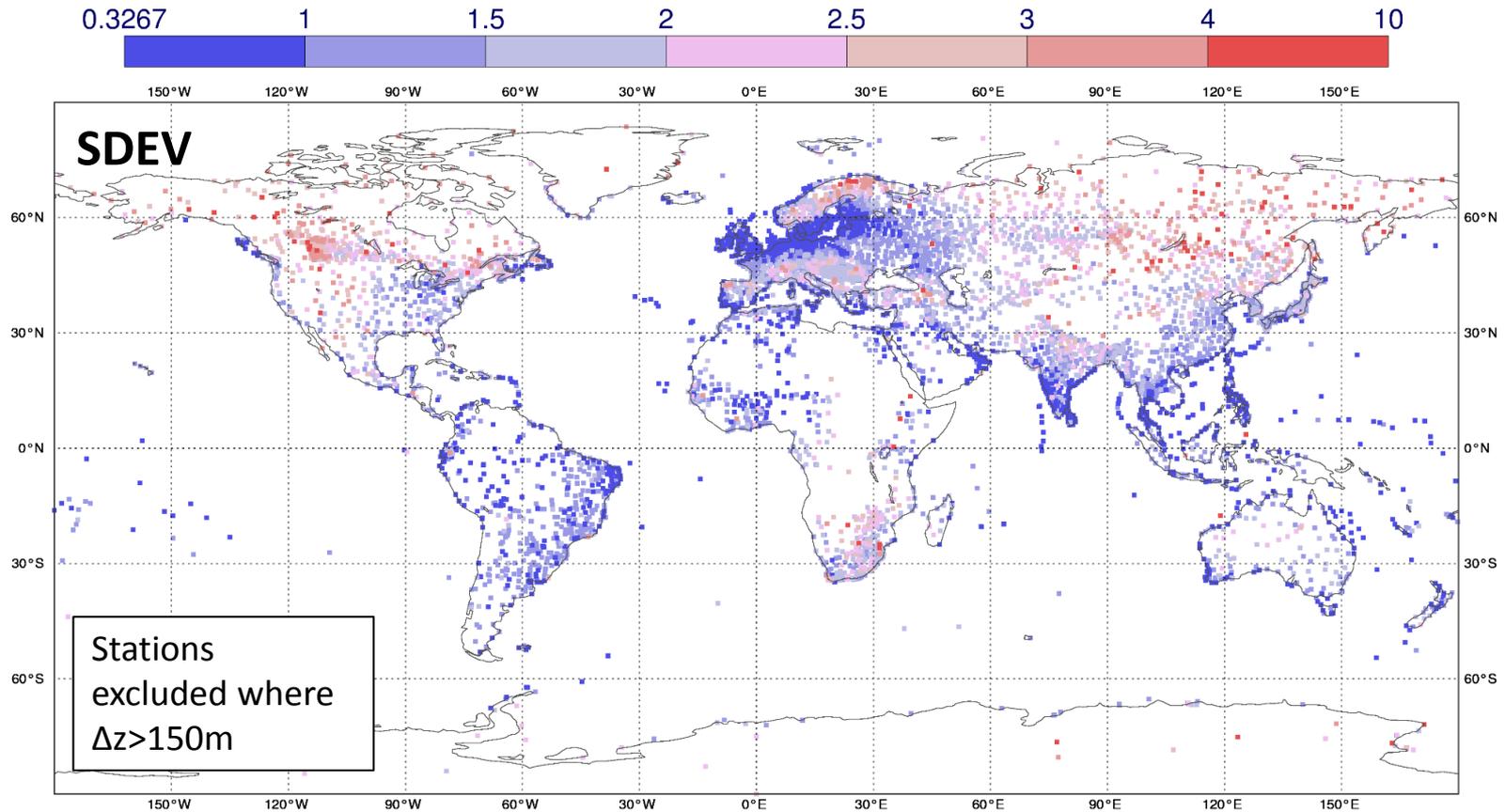
Regional variations



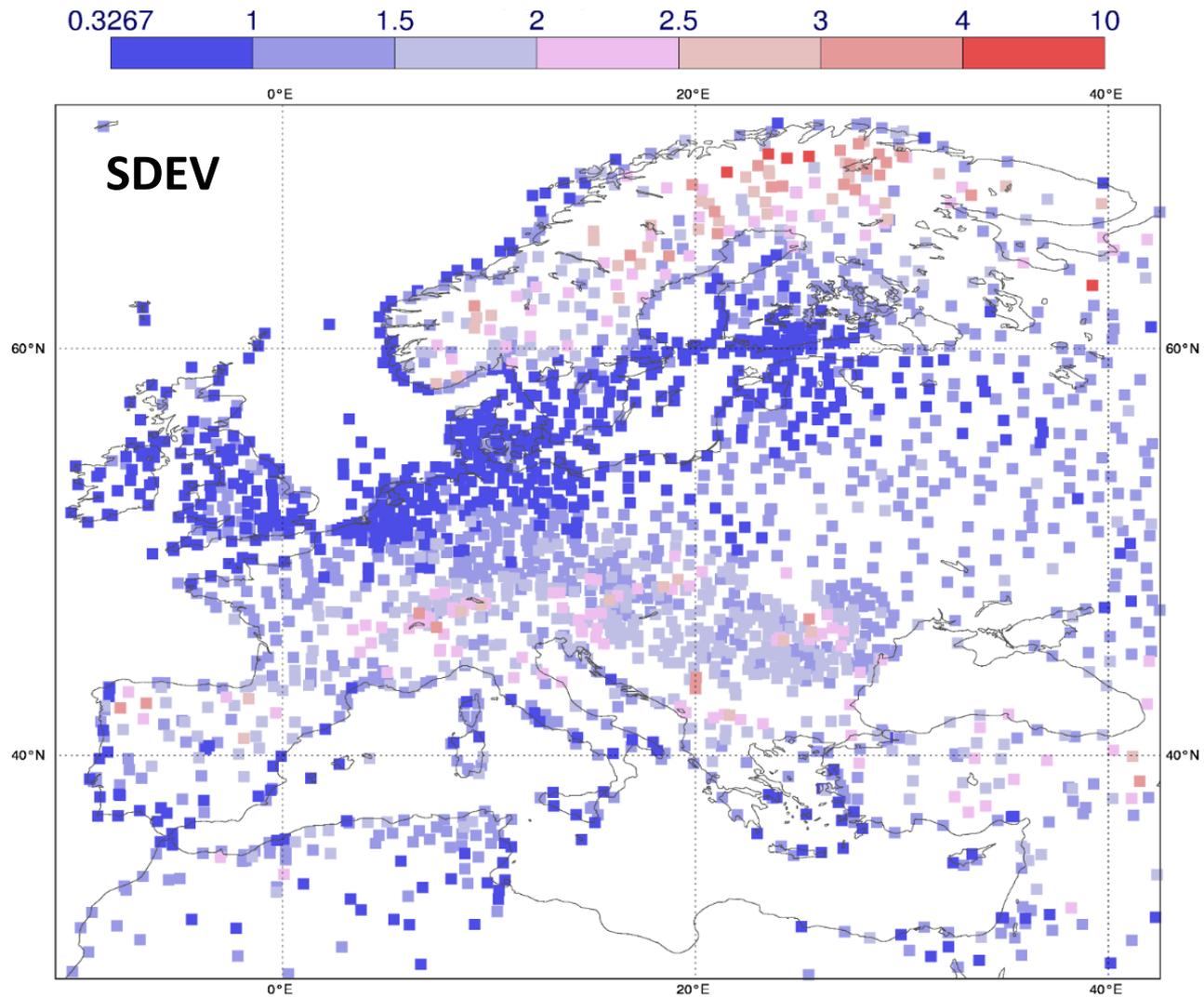
Regional variations



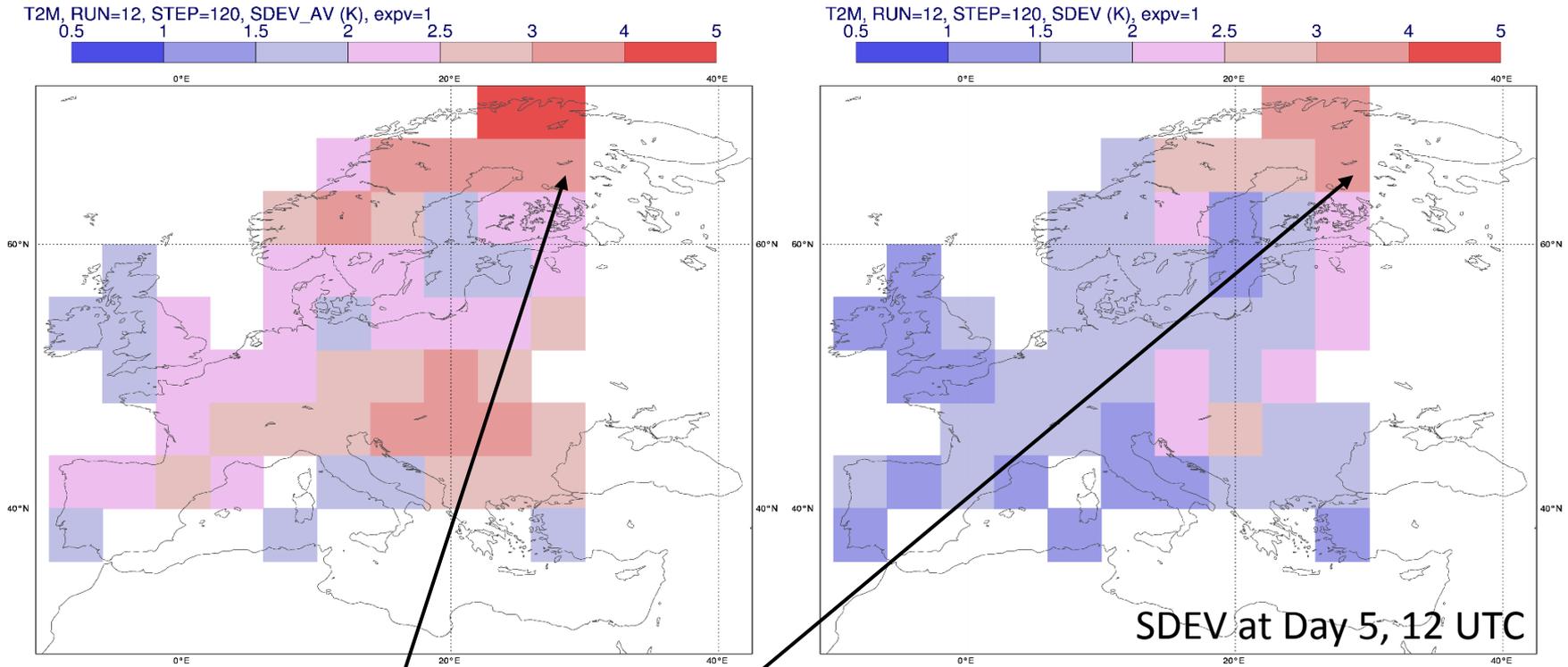
Regional variations



Europe

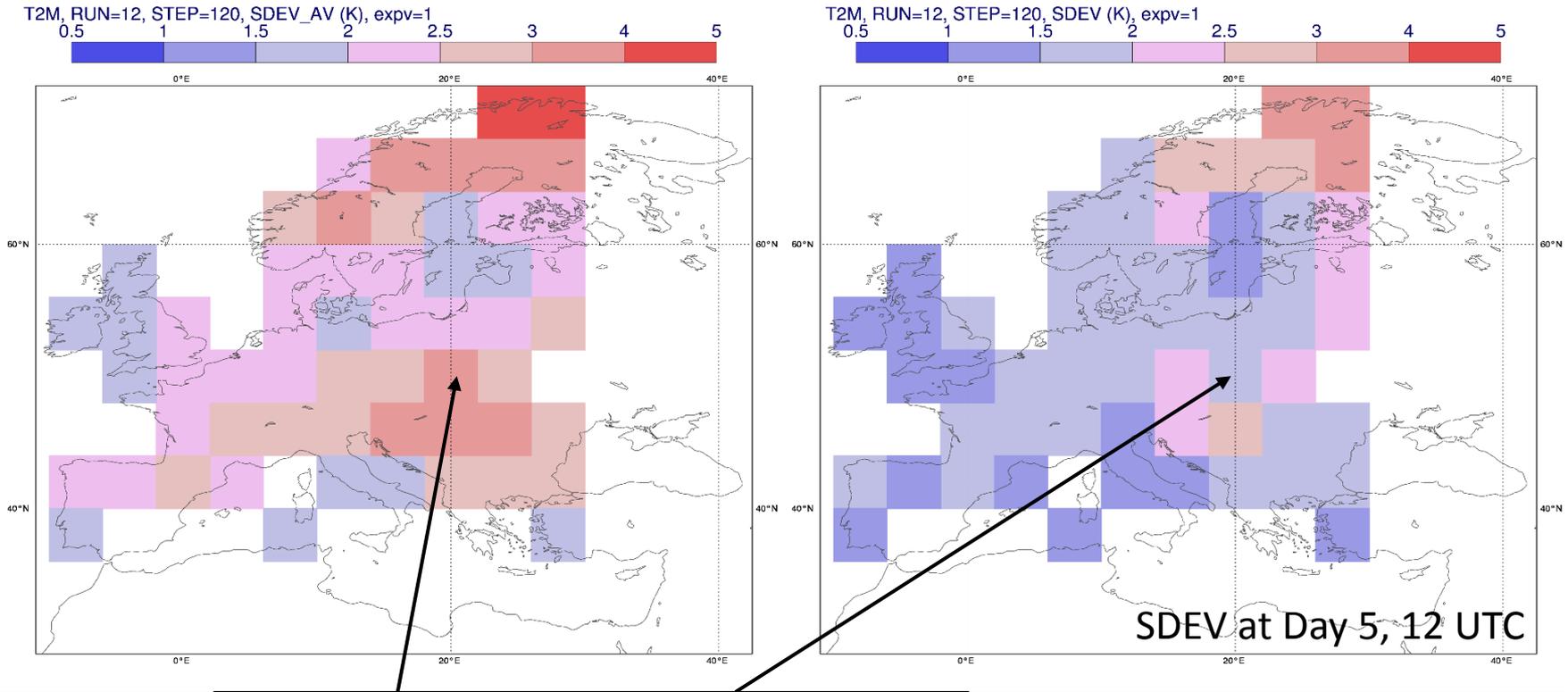


Upscaling to ~400 km (4 deg)



Problem: strong surface inversions over snow

Upscaling to ~400 km (4 deg)



Problem: low stratus boundaries and persistence

Conclusions / applications

- Studying representativeness is a worthwhile endeavour 😊
 - Characteristics differ greatly between parameters
 - Different approaches are being tested
 - Scale-dependent verification (upscaling, FSS) provides insights
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- Spatial extrapolation of station observations
 - Assessment of 'footprint' of potential future obs sites
 - Estimation of improvements due to future resolution upgrades

Estimation based on Taylor hypothesis

