



Norwegian  
Meteorological  
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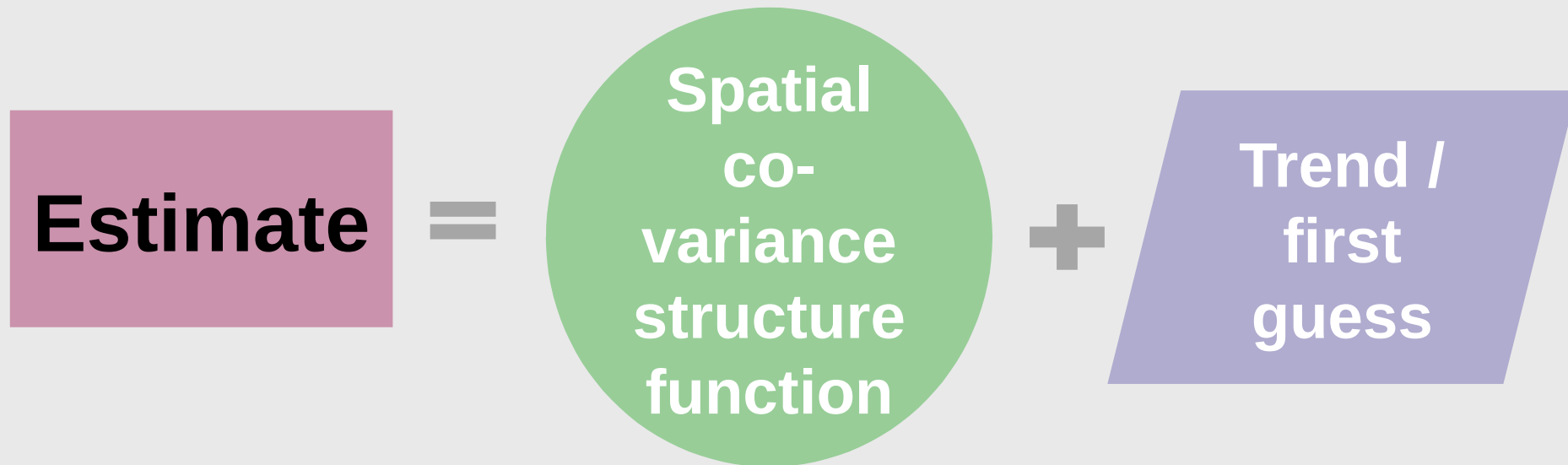
# Some considerations on the temporal and spatial variations in gridding predictors.

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<sup>1</sup>Norwegian Meteorological Institute

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# Spatial analysis



# Background/Motivation

- Many gridded datasets are based on a residual interpolation approach where a set of external predictors describing the background (or trend field).
- The definition of the background is often held constant both in time and space, based on long term climatologies.

Large anomalies when applied on daily data.

- We want to investigate spatial and temporal variations of the predictor fields in order to

Better understand the sensitivity of the choice of predictors under different atmospheric conditions

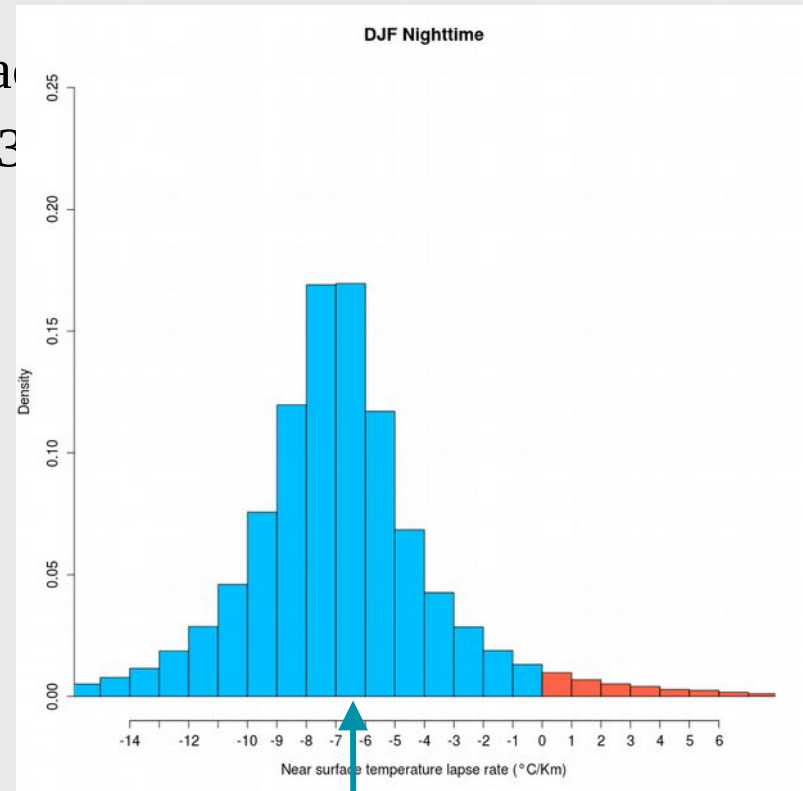
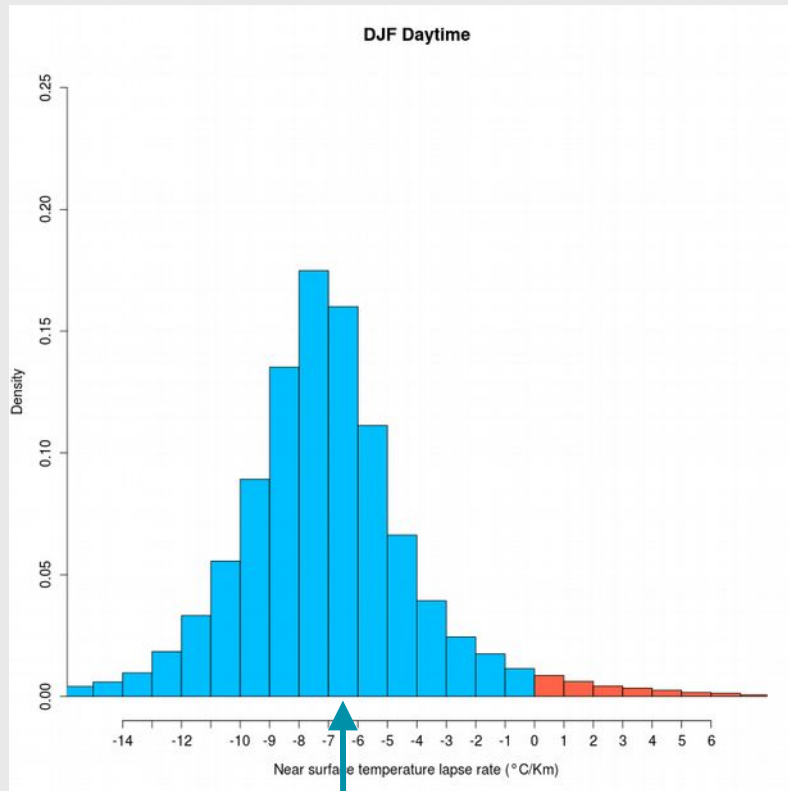
Better understand the spatial variations in the significance of predictors.

Look at the uncertainties of the methods.

Move towards an ensemble-approach for gridding.

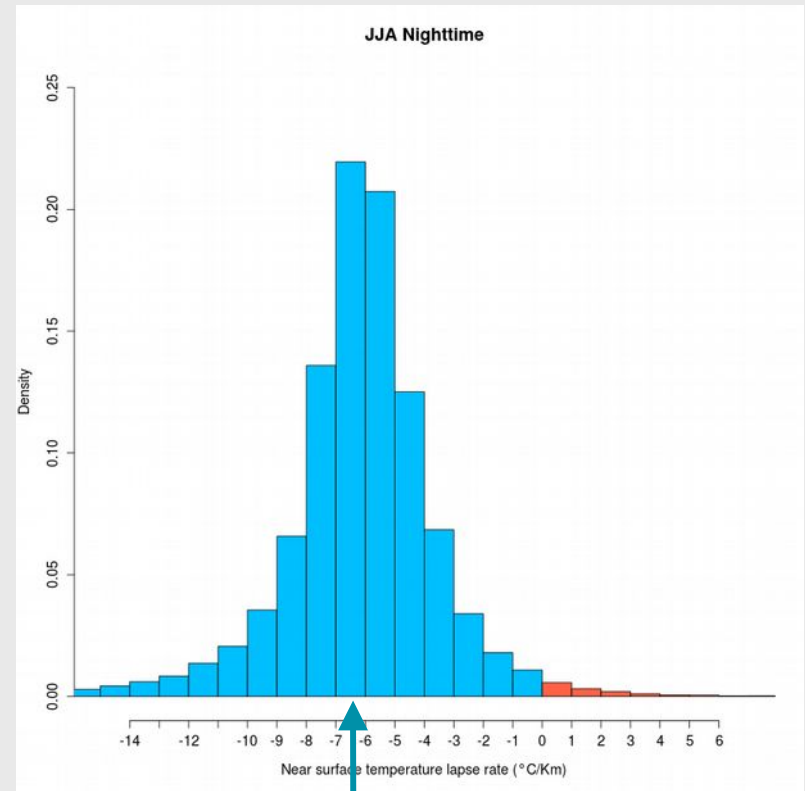
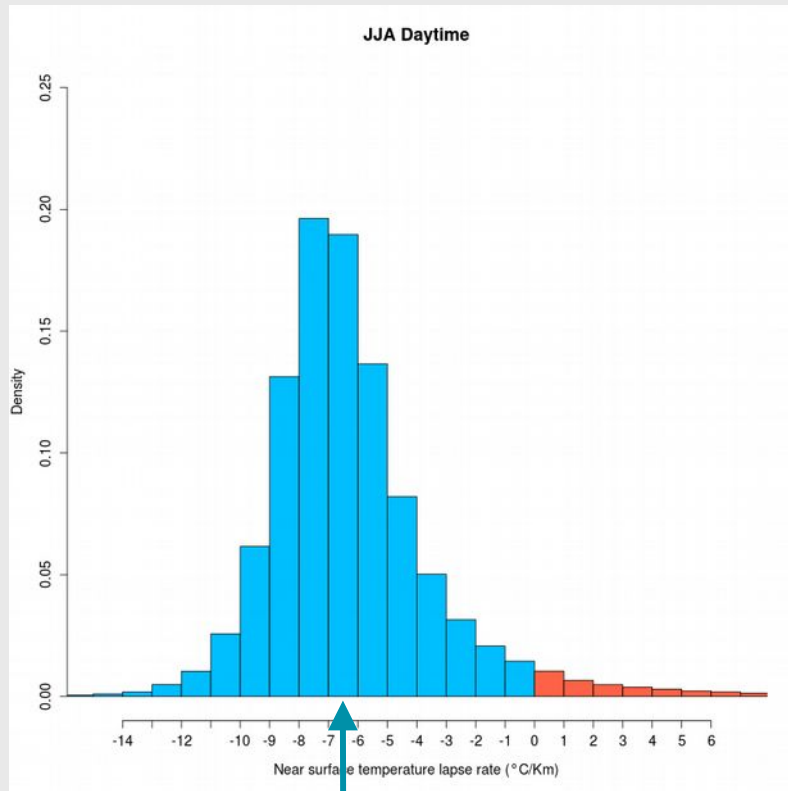
- Focus here: Temperature

# Results: near-surface lapse rate



Based on hourly temperature observations

# Results: near-surface lapse rate

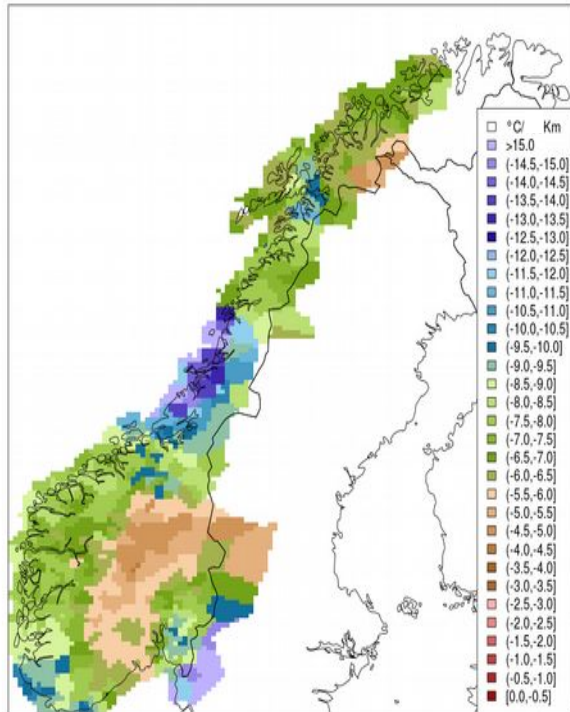


Based on hourly temperature observations

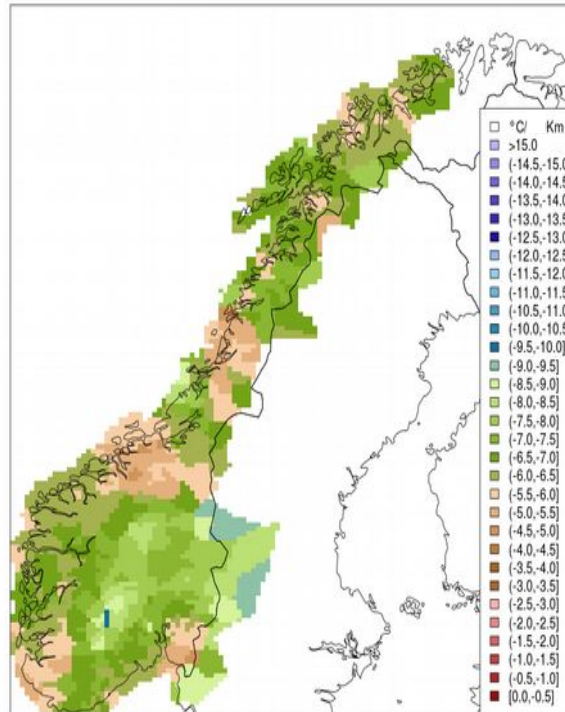
# Results: near-surface lapse rate\*

## Daytime

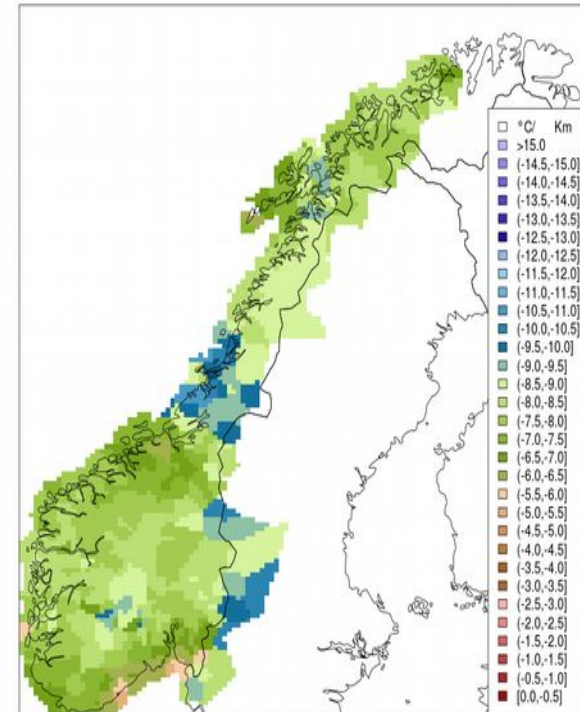
Observed mean negative near-surface temperature lapse rate, DJF 14 UTC



Observed mean negative near-surface temperature lapse rate, JJA 14 UTC



Observed mean negative near-surface temperature lapse rate, MAM 14 UTC



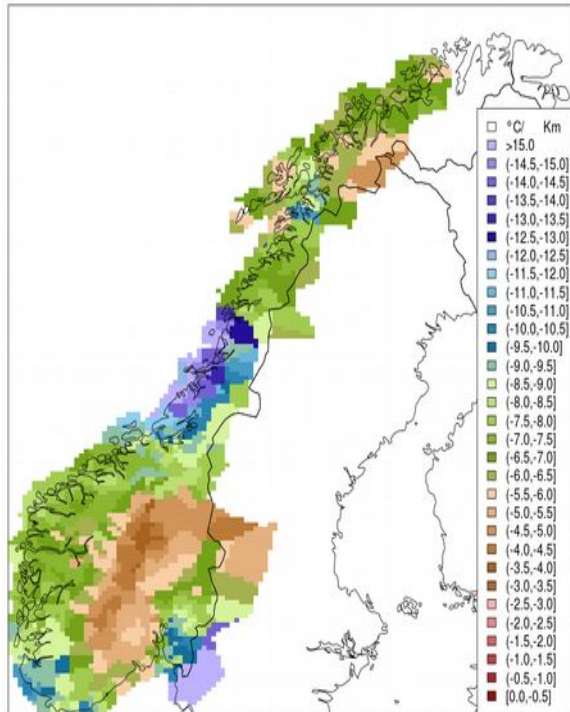
Values are in °C/Km

\*Positive values filtered out

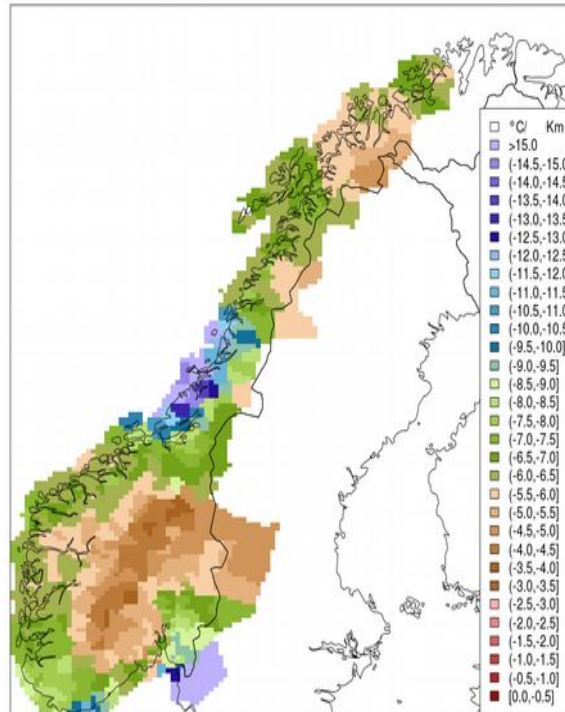
# Results: near-surface lapse rate\*

## Nighttime

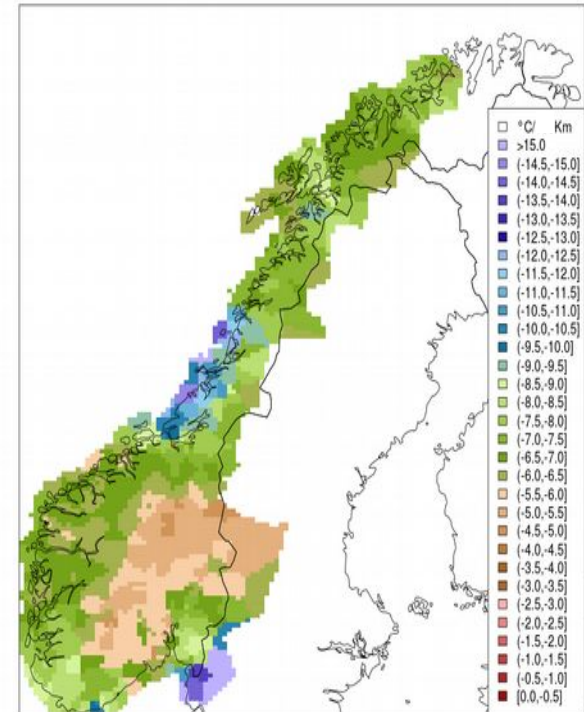
Observed mean negative near-surface temperature lapse rate, DJF 4 UTC



Observed mean negative near-surface temperature lapse rate, SON 4 UTC



Observed mean negative near-surface temperature lapse rate, MAM 4 UTC



Values are in °C/Km

\*Positive values filtered out



# NGCD – Nordic gridded dataset

- Extension of the Norwegian gridded climate datasets

1. January 2008

- Observation basis for UERRA evaluations and uncertainty assessments for Fennoscandia

- Two-member «ensemble»

SeNorge 1.1 Residual kriging, fixed monthly global trend from climatology. Five predictors.

SeNorge 2.0 Bayesian OI, background field from analysis of the observation field.

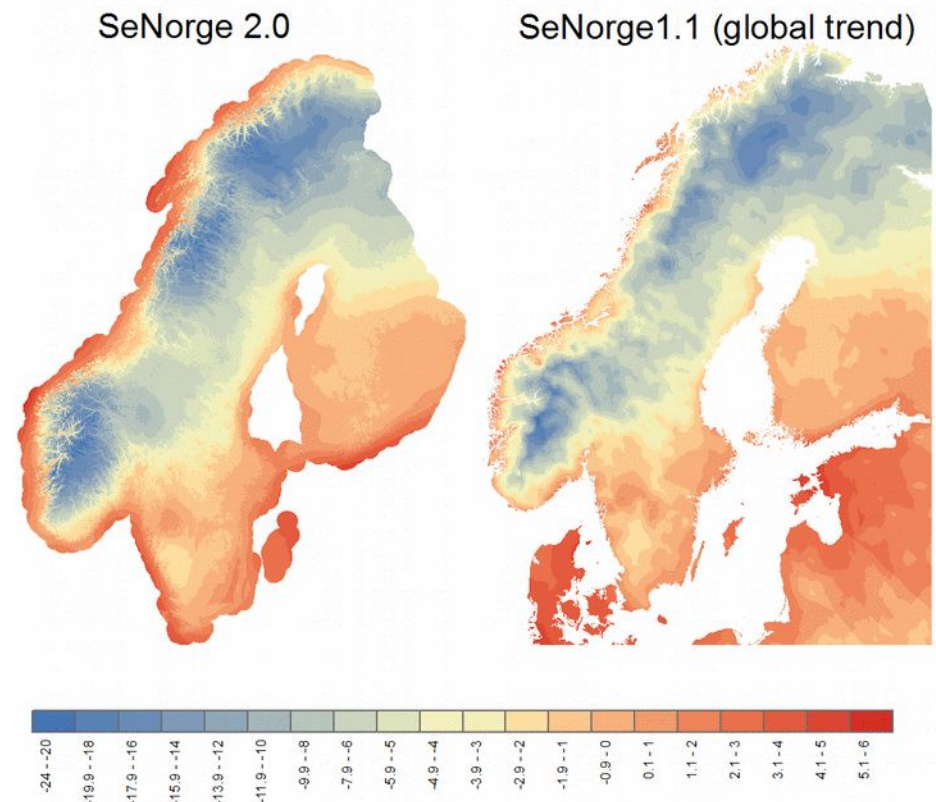
Regionalized conditioned vertical lapse rate is used to establish the background.

- Spatial resolution: 1 km

- Period: 1981-2010

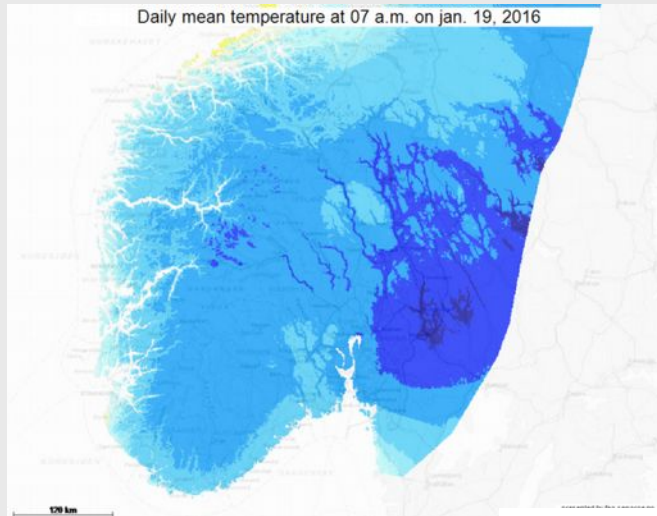
- Coverage: Fennoscandia

- Data: ECA&D + MET Norway climate data base

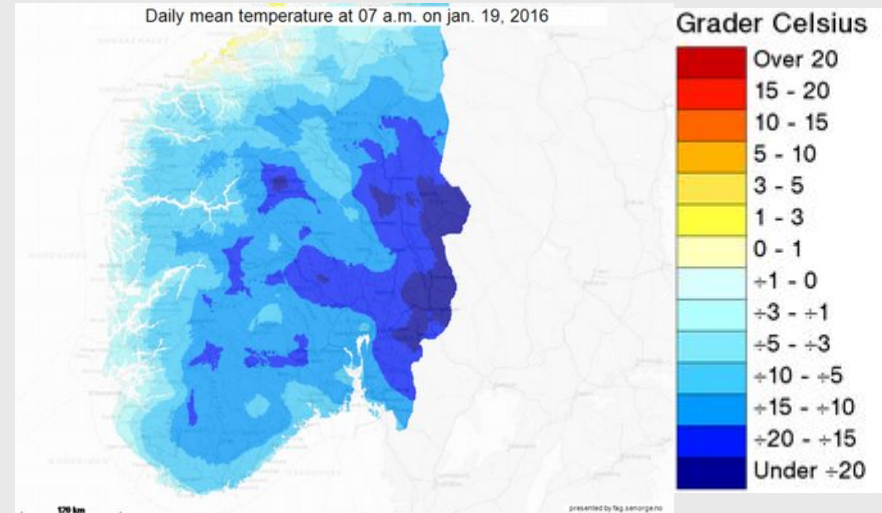




## SeNorge 2.0

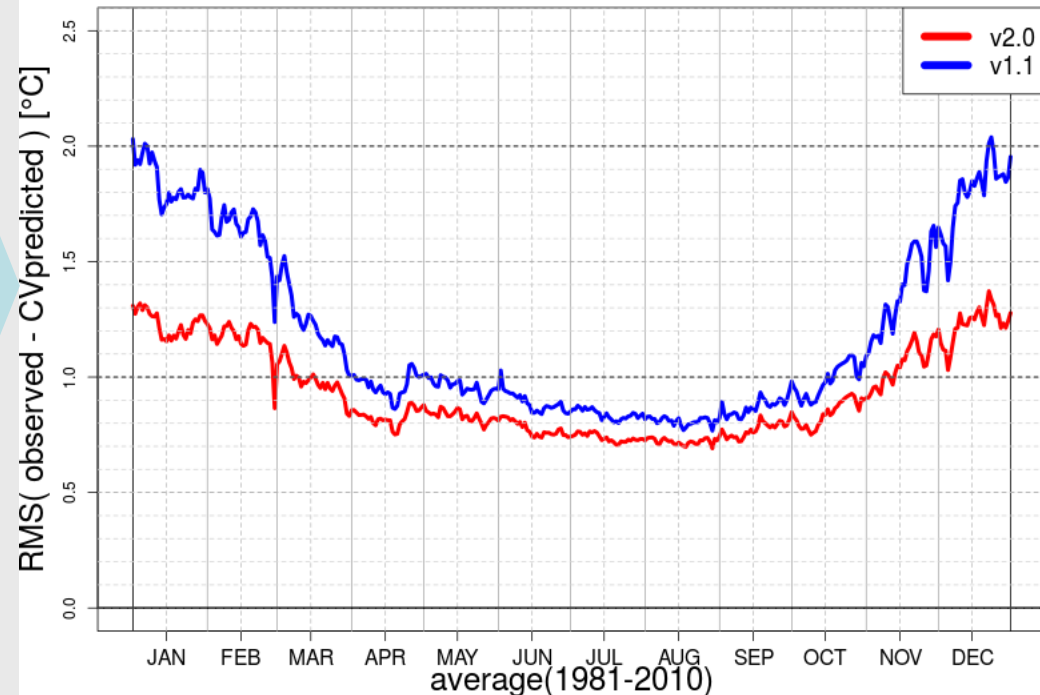


## SeNorge 1.1



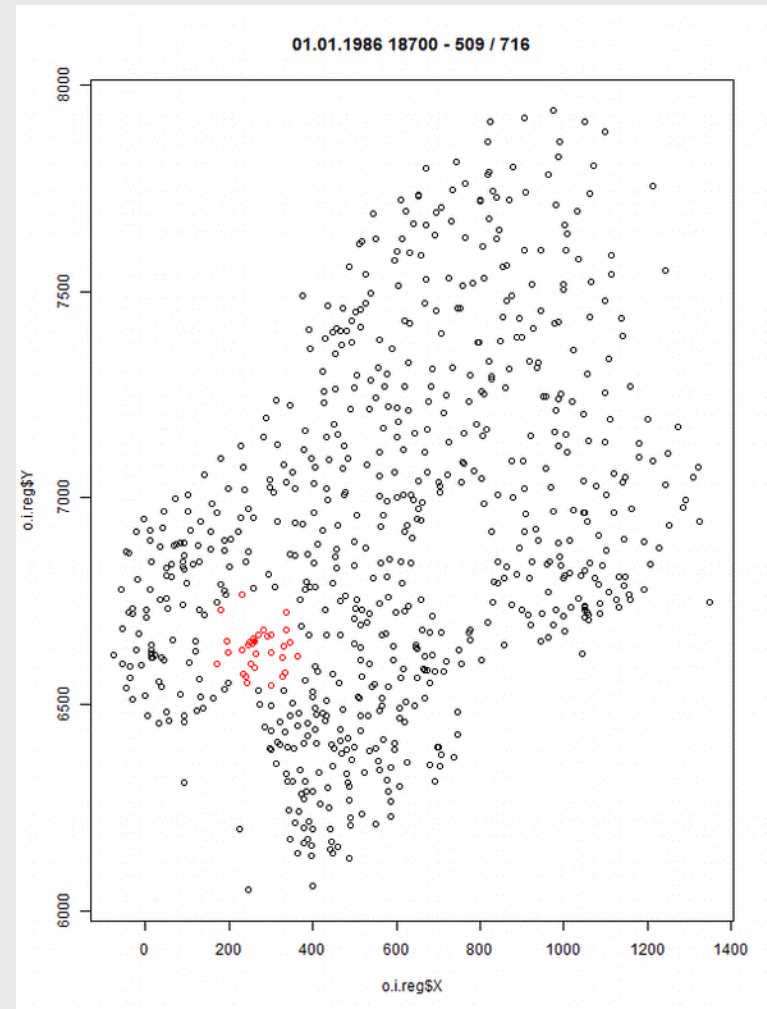
New method  
reduce estimation  
error.

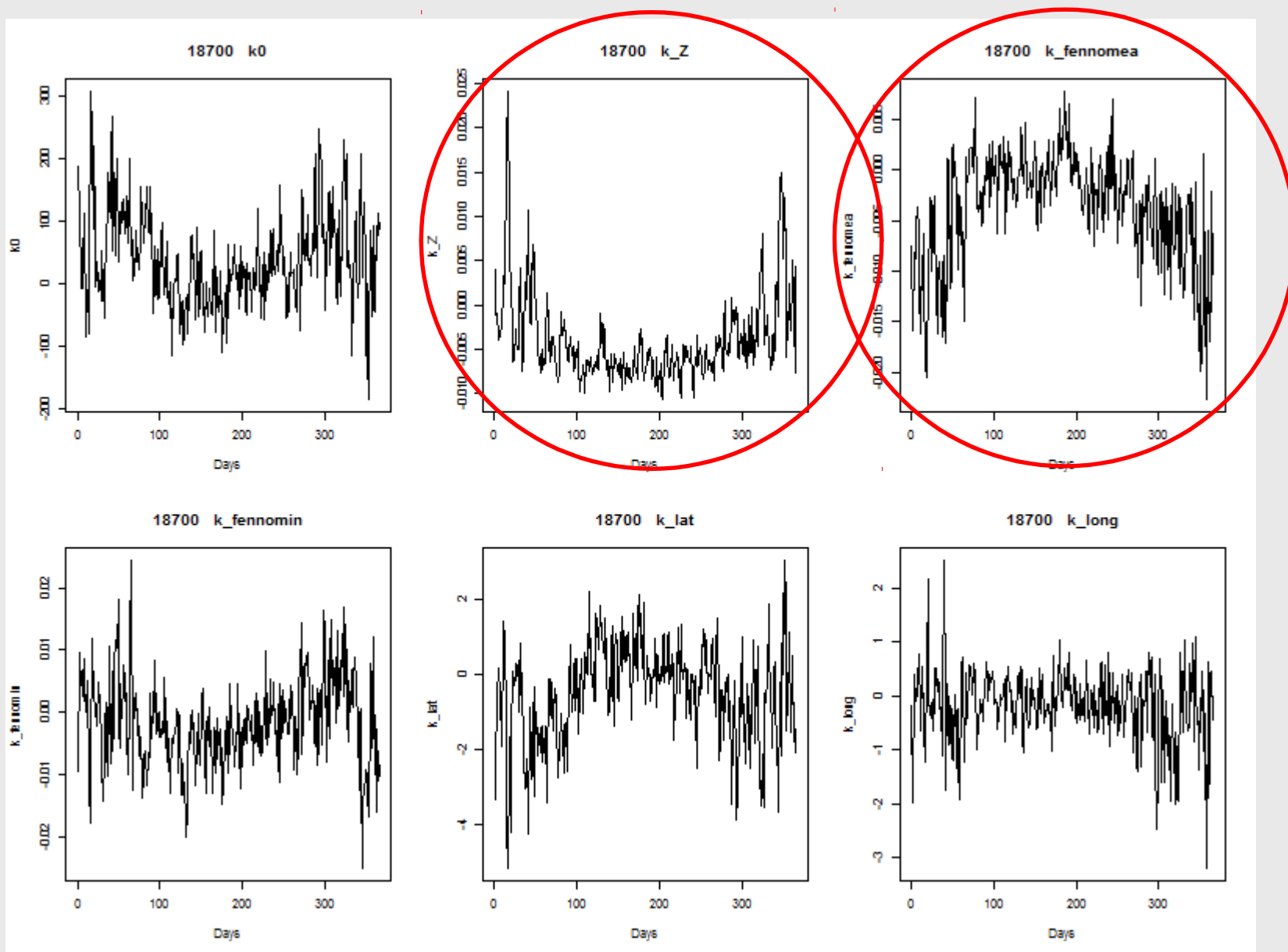
(RMSE, independent  
cross-validation)



# Sensitivity of external predictors

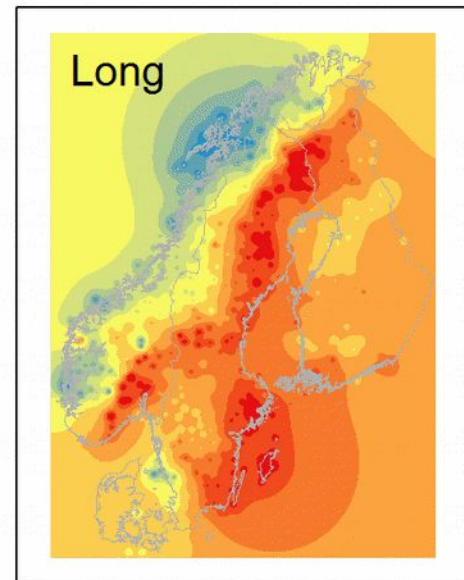
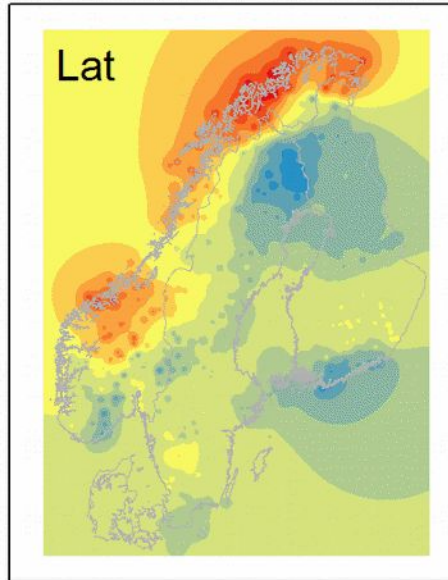
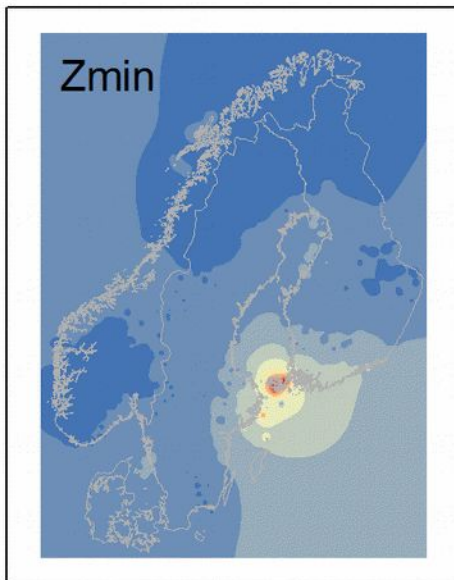
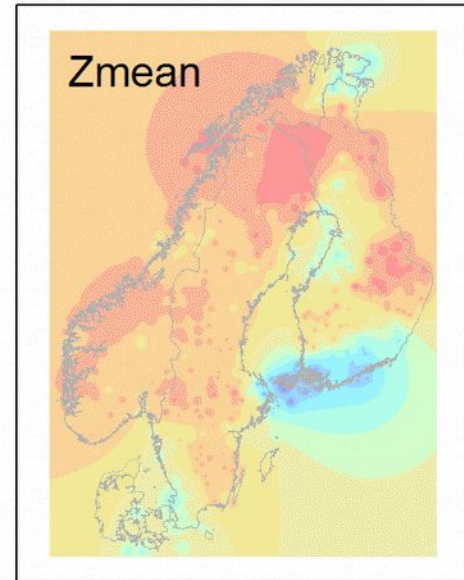
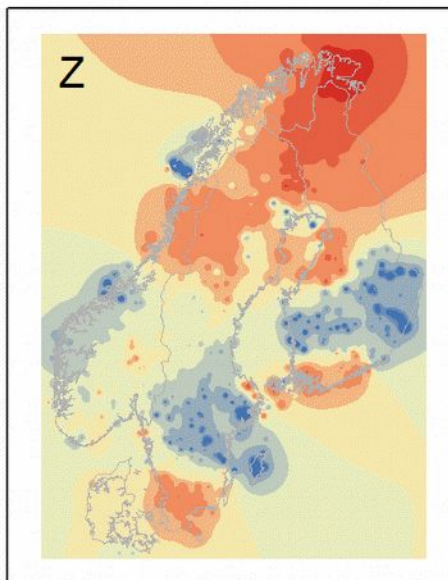
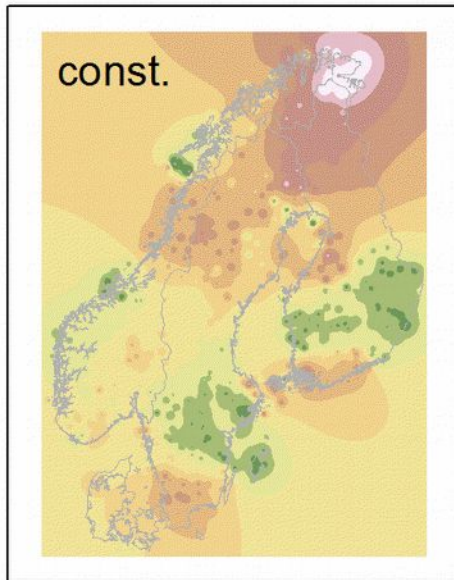
- Ongoing work (full results from only one year, **2008**, so far) applying data from all Nordic countries as a part of developing the Nordic gridded climate dataset (NGCD)
- **Daily parameters** are estimated applying the thirty nearest observations to each estimation points as input to the multiple linear regression (version 1.1 approach).
- We see large variations in coefficients from day to day related to the actual weather situation



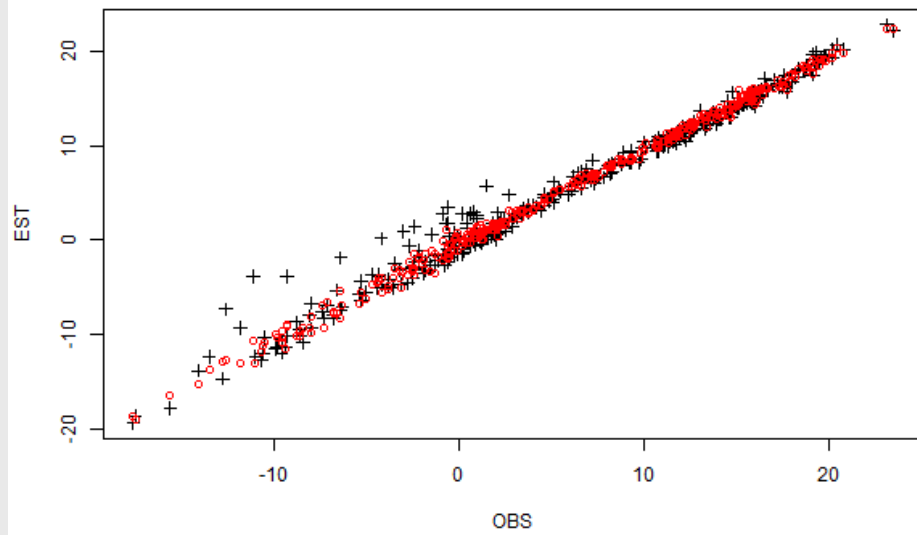


1981

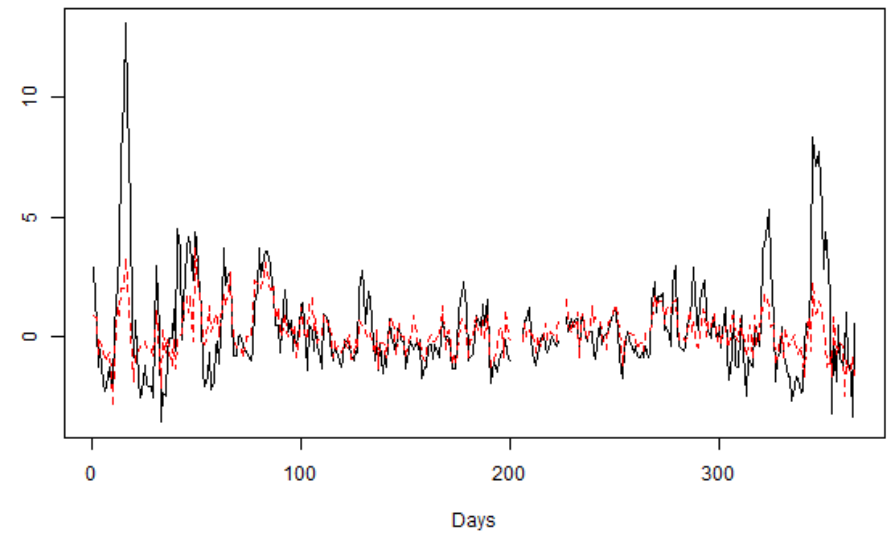
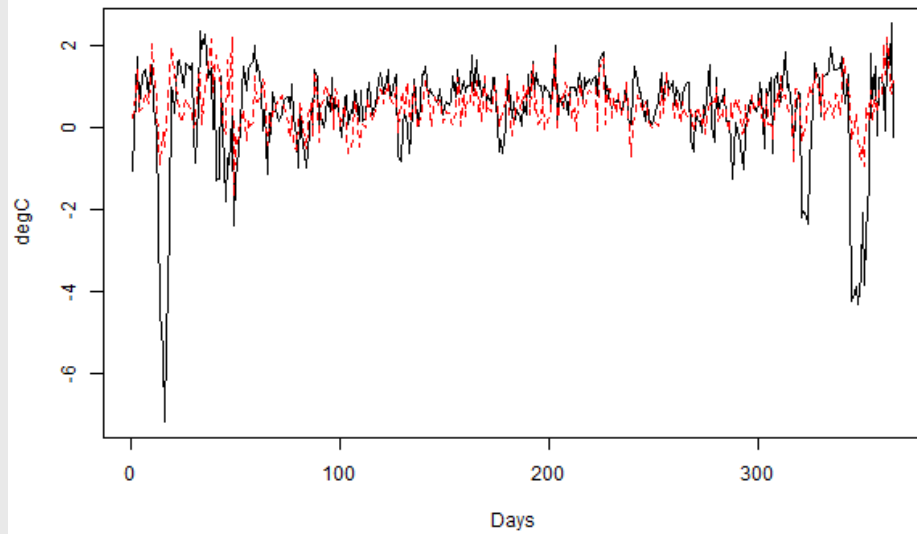
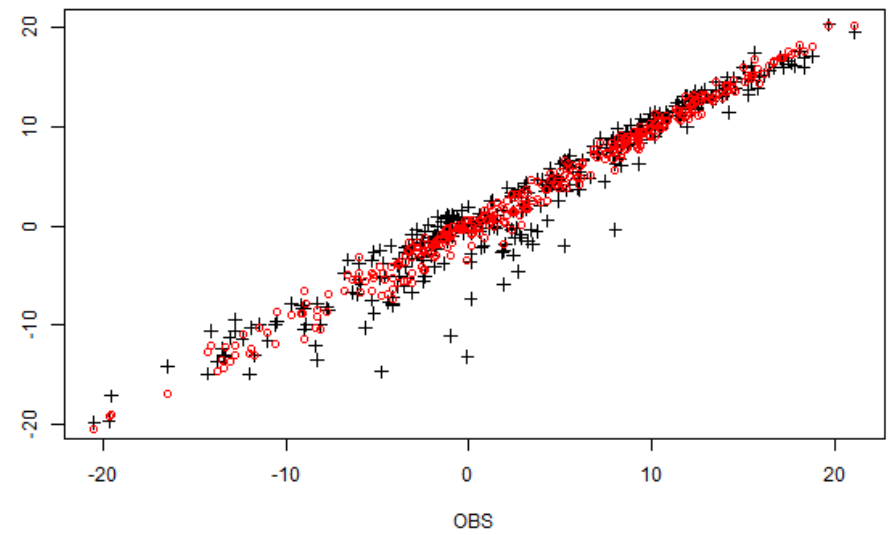
01.01.2008



18700



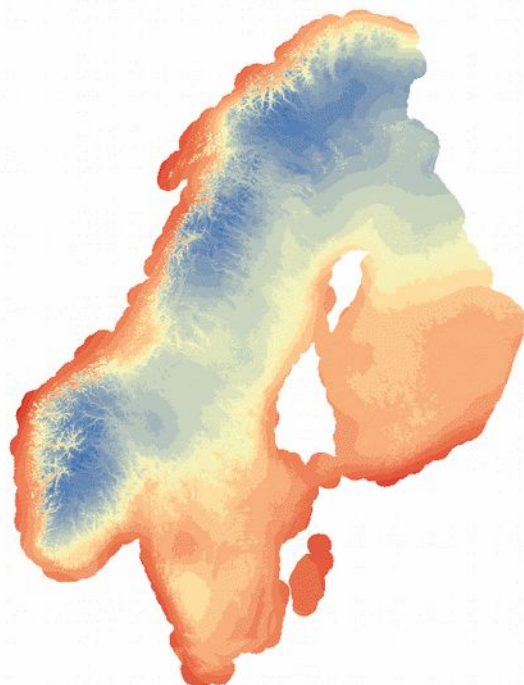
18950



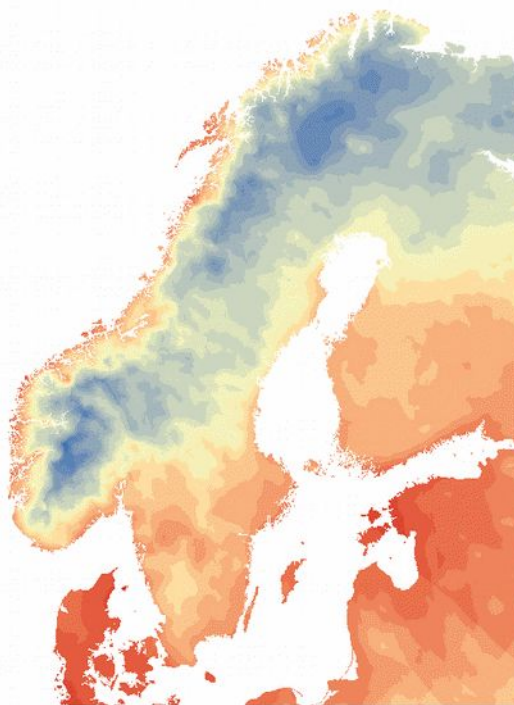


1. January 2008

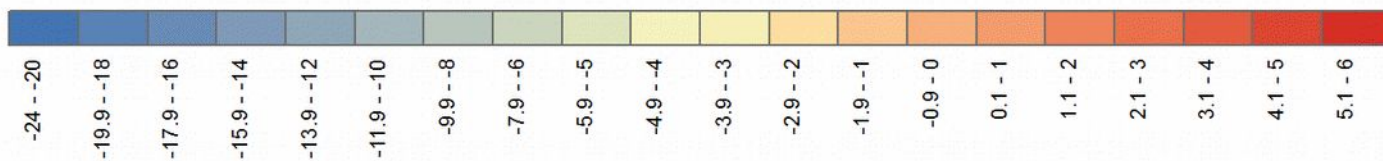
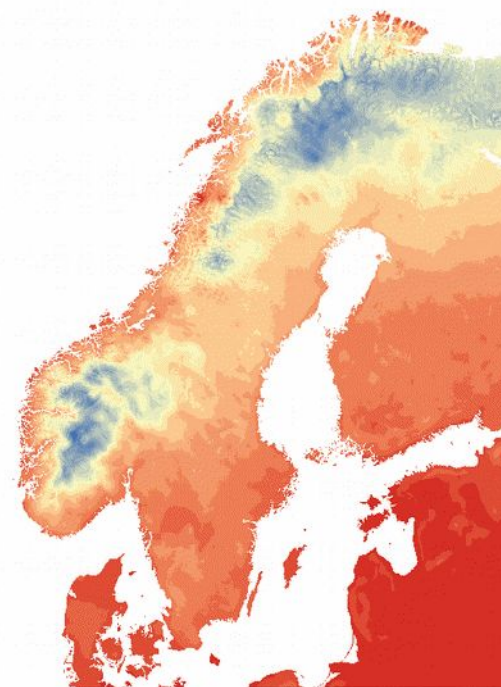
SeNorge 2.0



SeNorge1.1 (global trend)

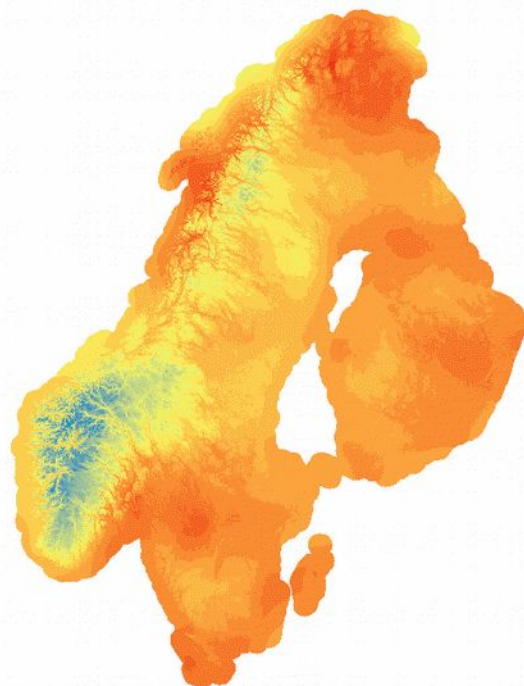


SeNorge1.1 (regional trend)

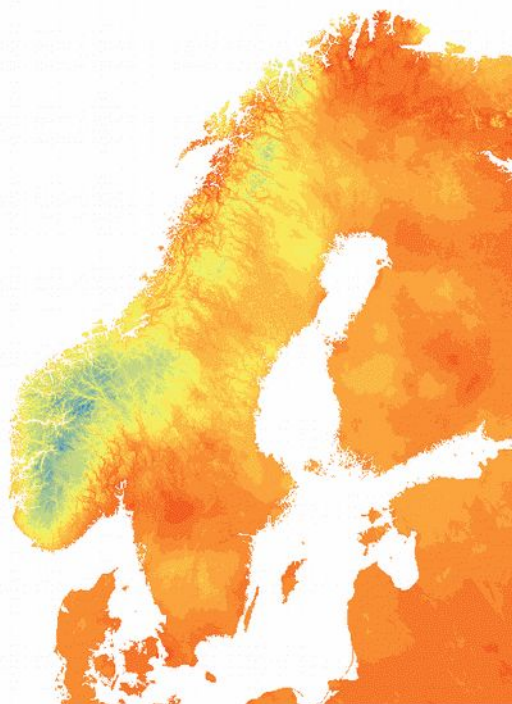


1. July 2008

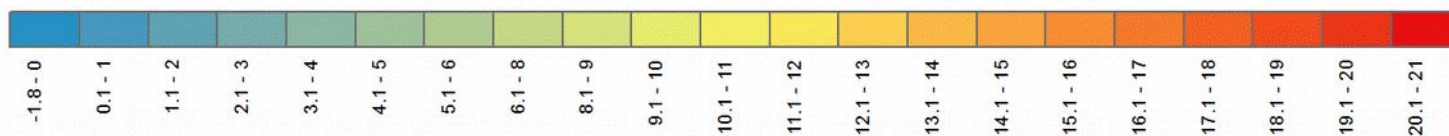
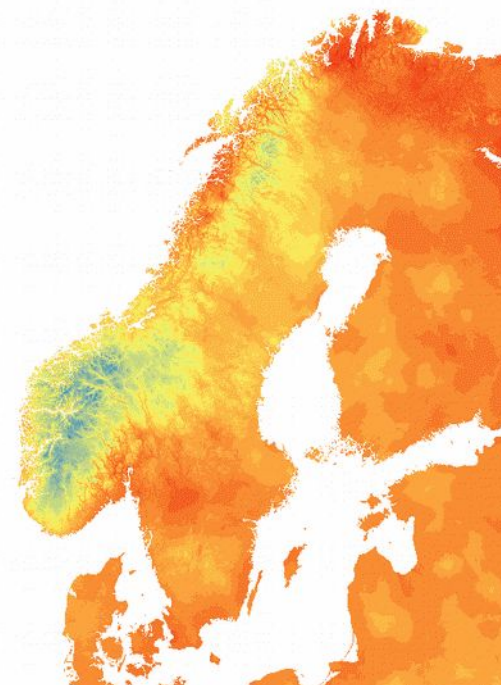
SeNorge 2.0



SeNorge1.1 (global trend)

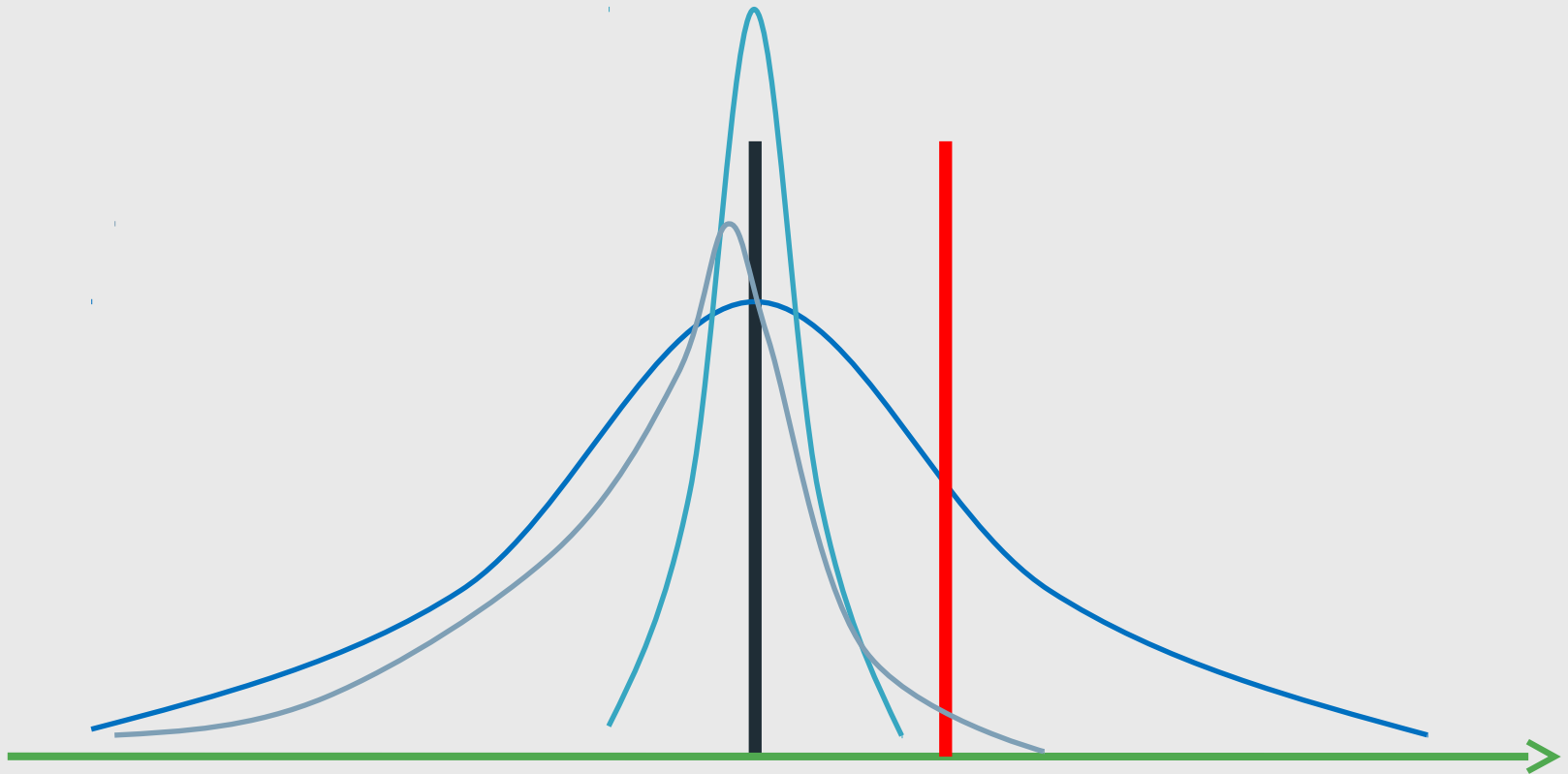


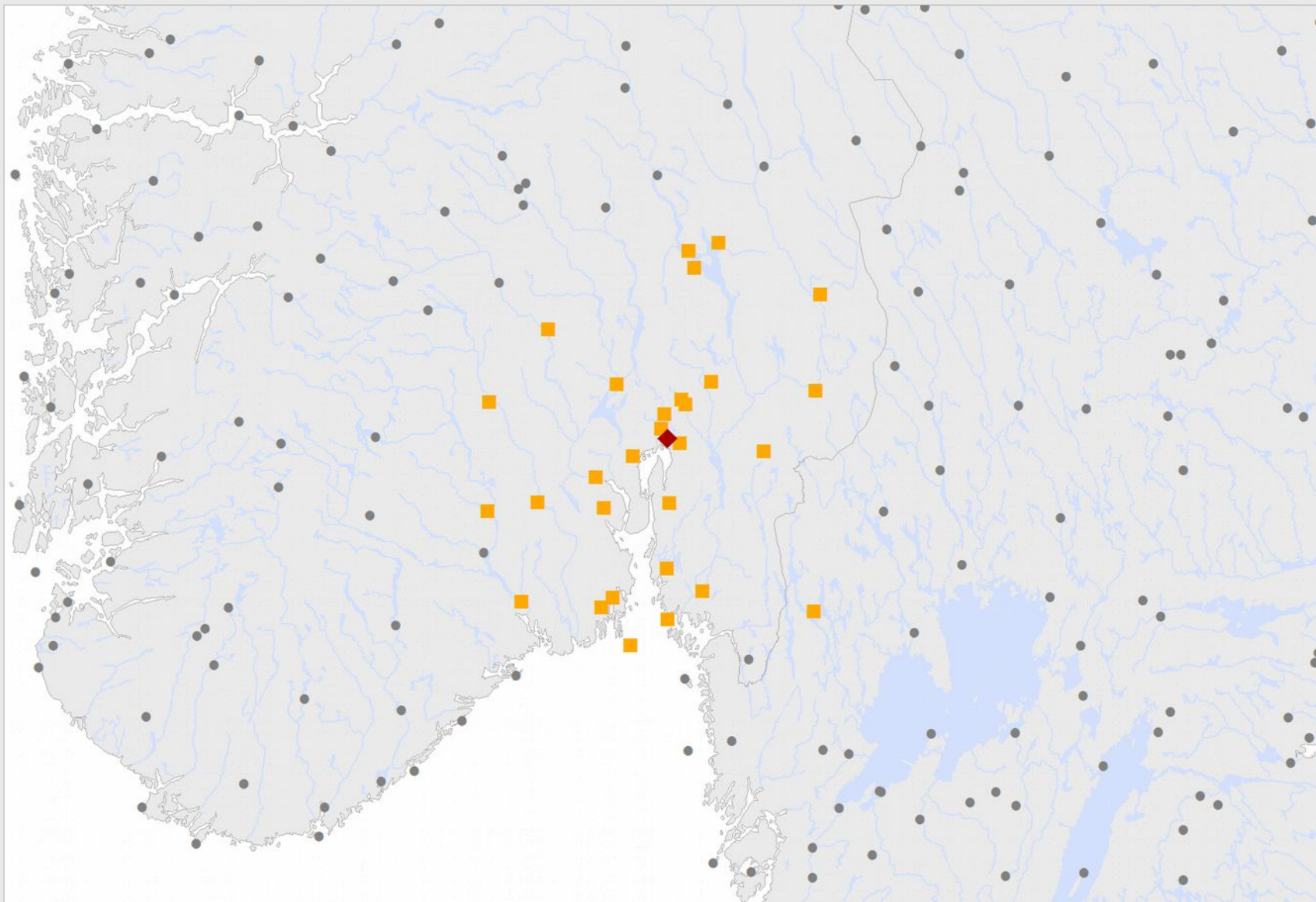
SeNorge1.1 (regional trend)

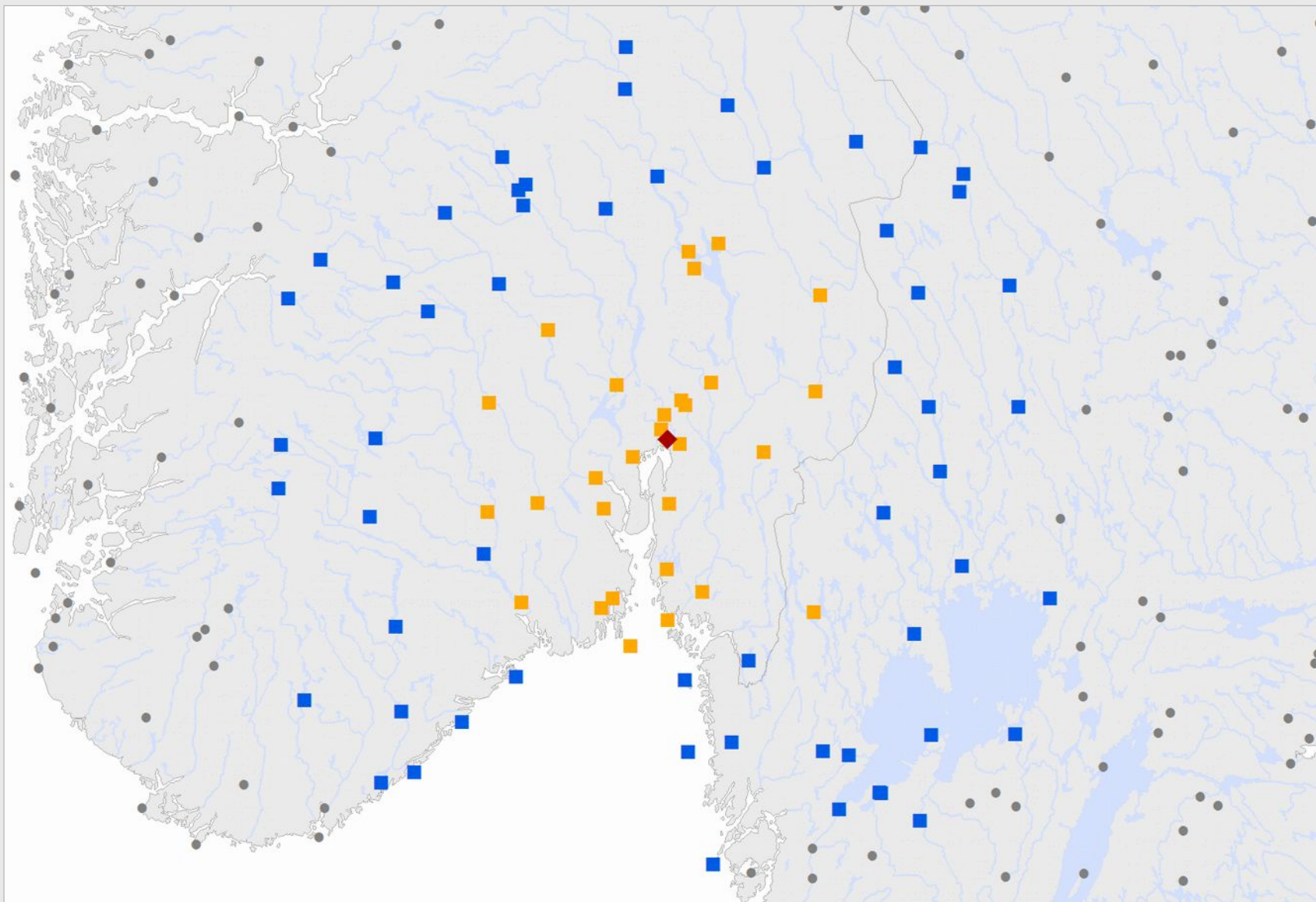




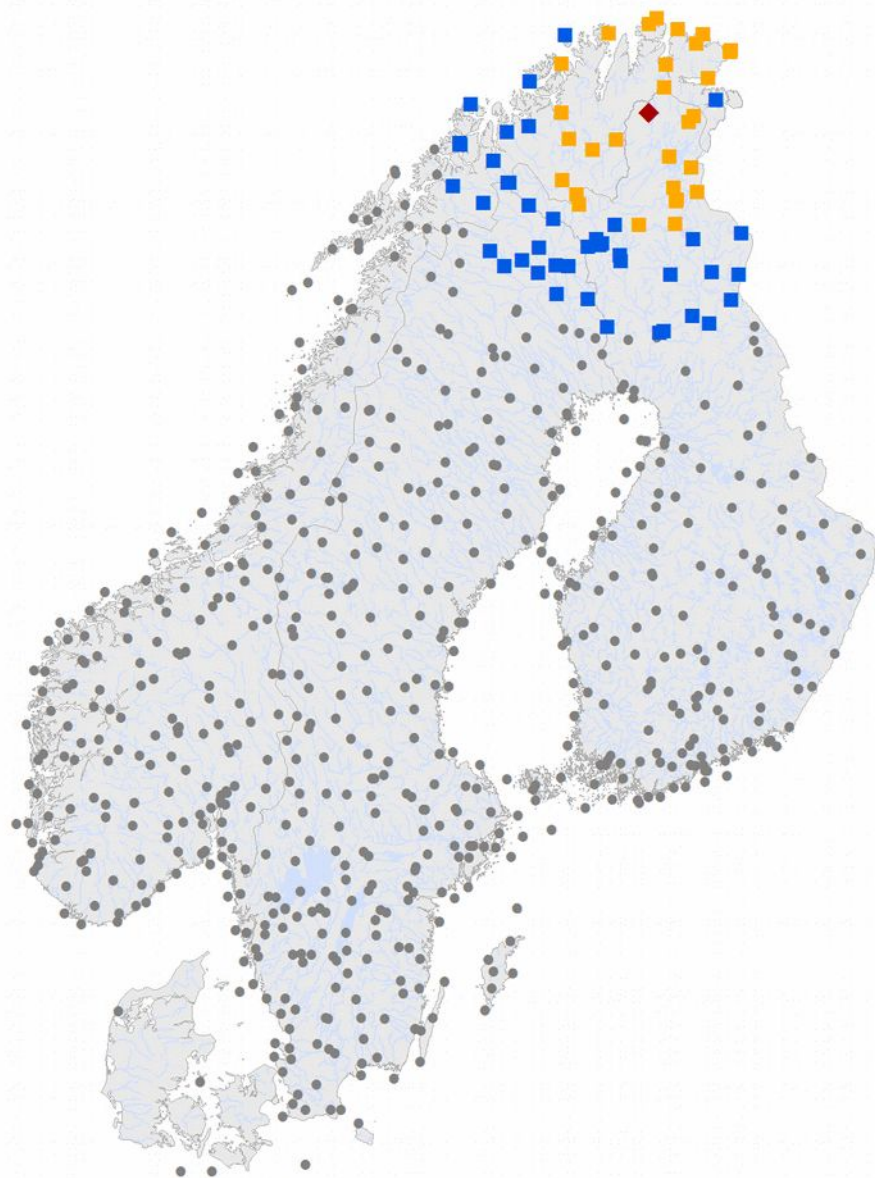
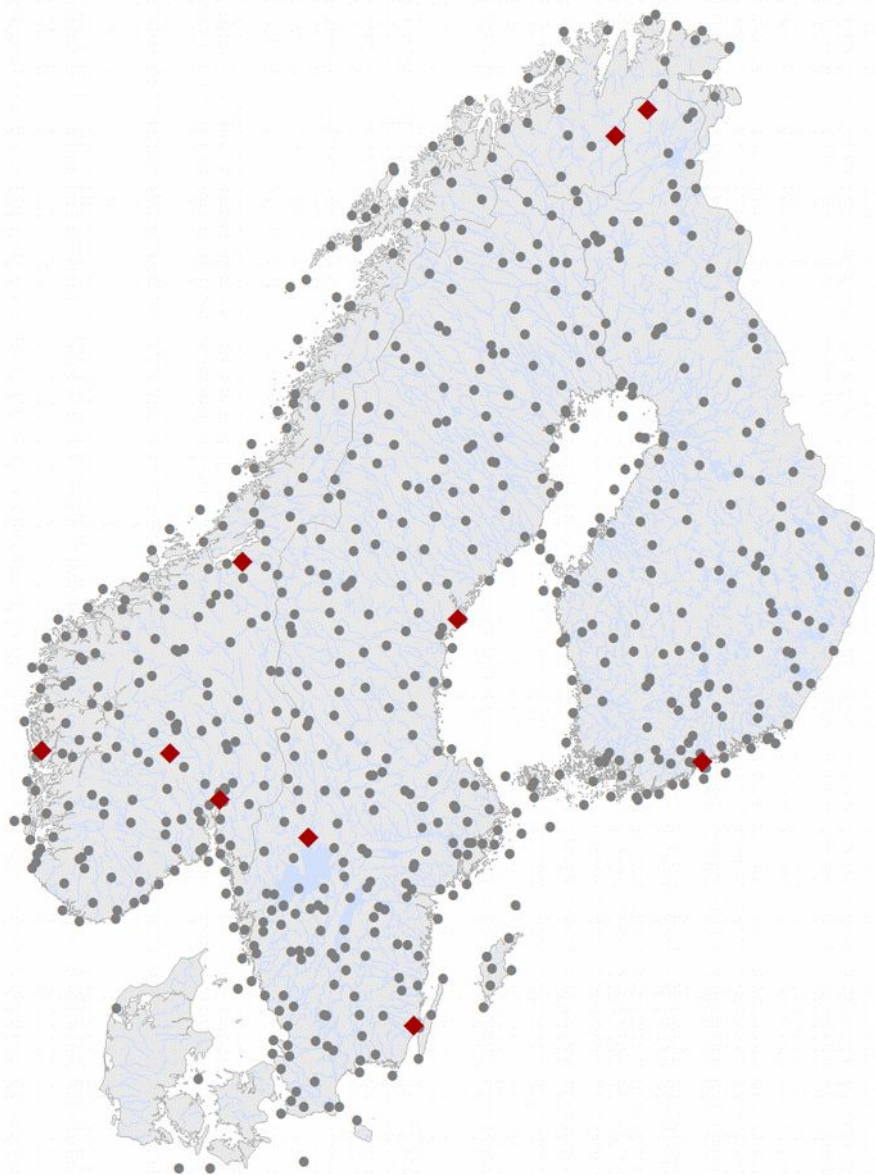
# From single estimates to probability distributions









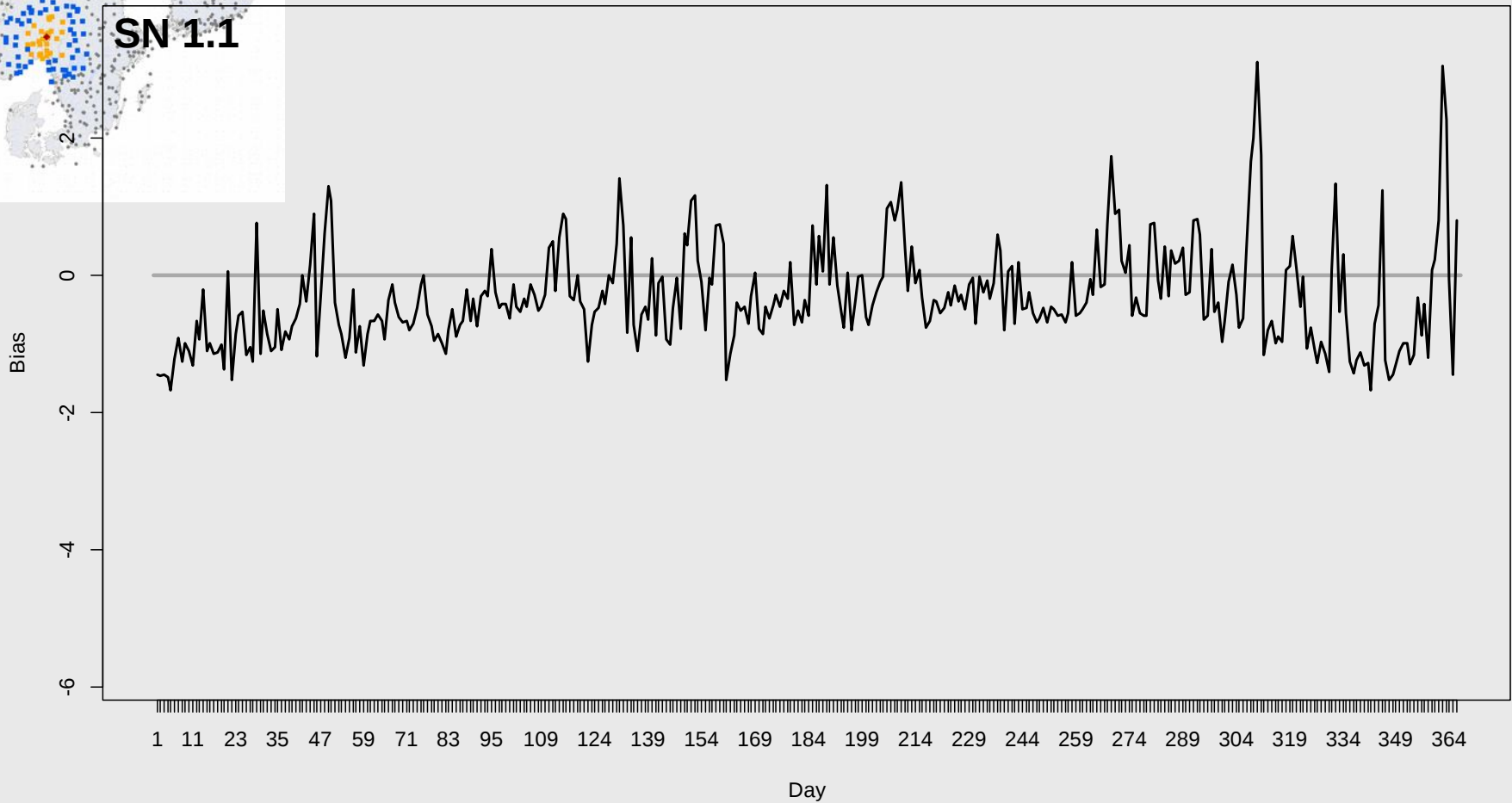


# 18700 Oslo – Blindern

## BIAS: Pred-Obs

18700 -- 2008

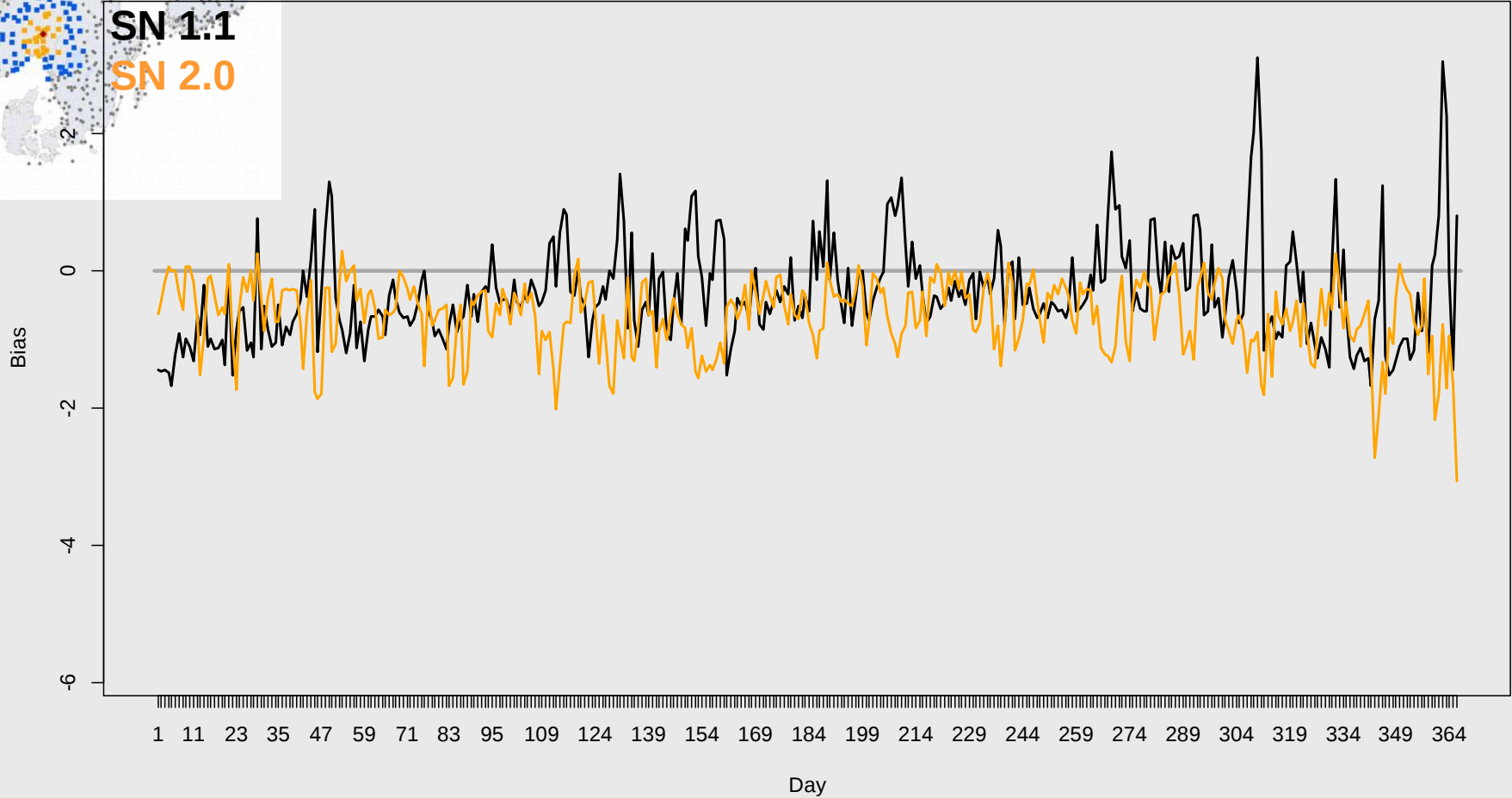
SN 1.1



# 18700 Oslo – Blindern

## BIAS: Pred-Obs

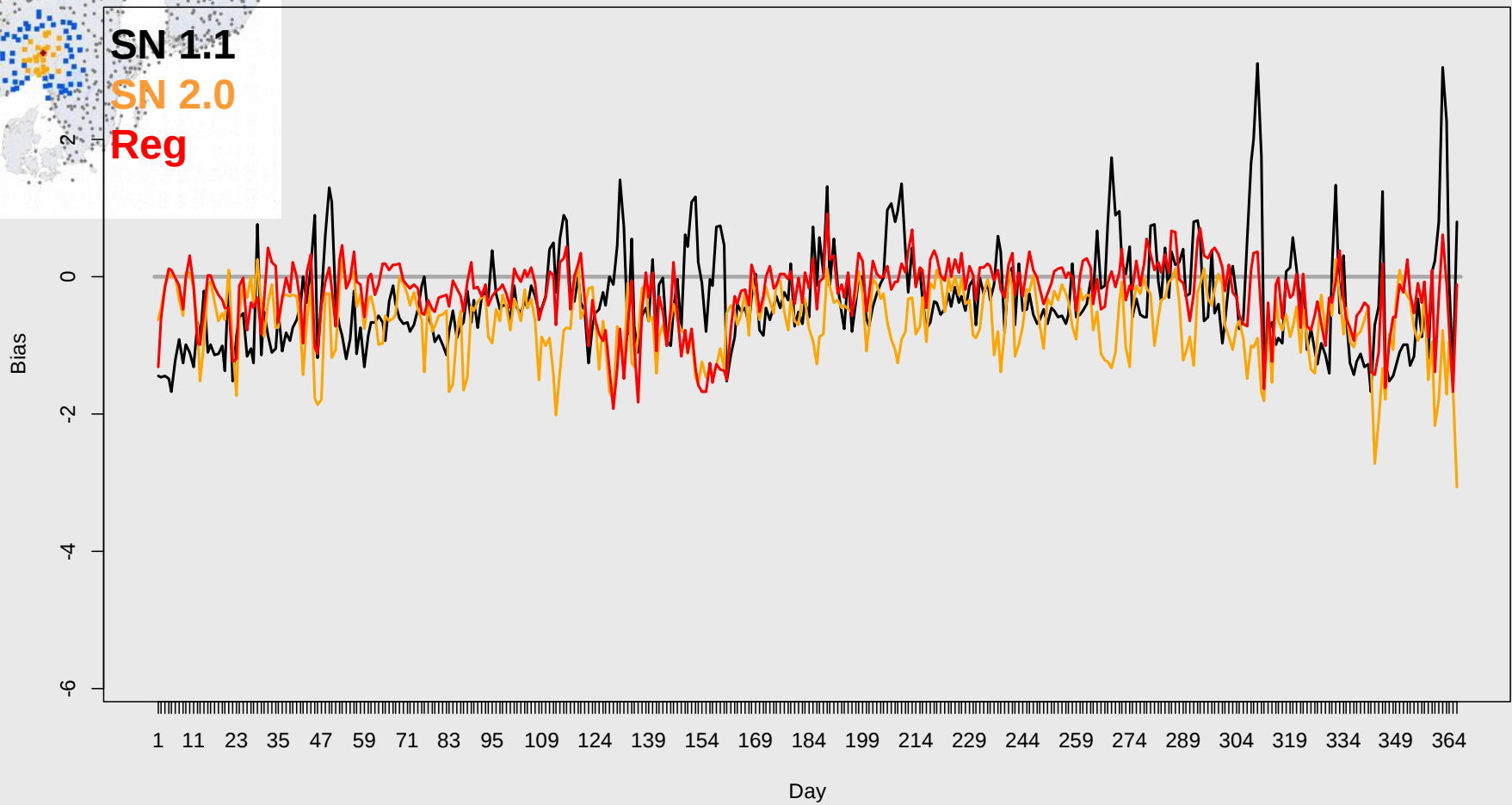
18700 -- 2008



# 18700 Oslo-Blindern

BIAS: Pred-Obs

18700 -- 2008

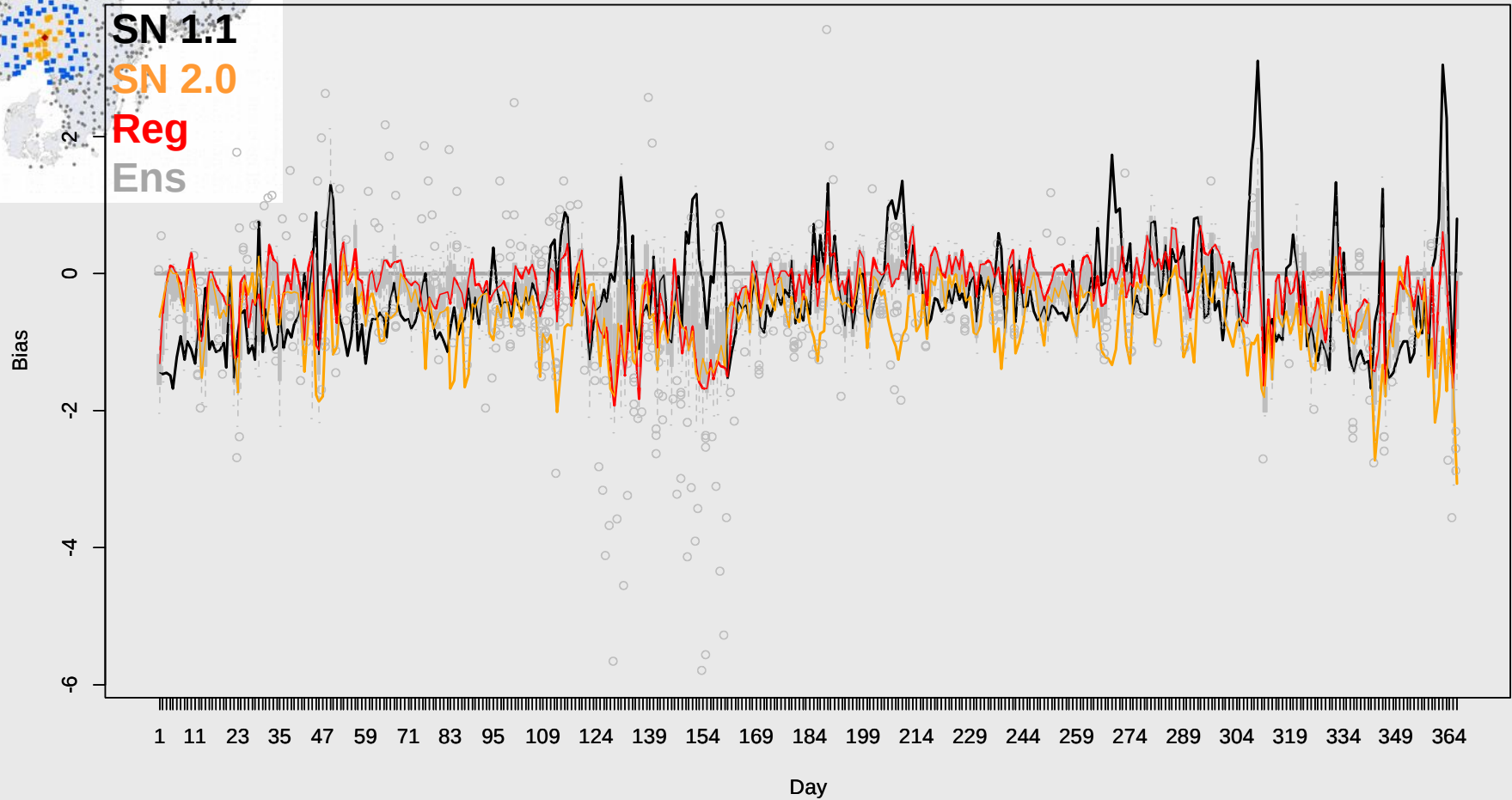




# 18700 Oslo-Blindern

BIAS: Pred-Obs

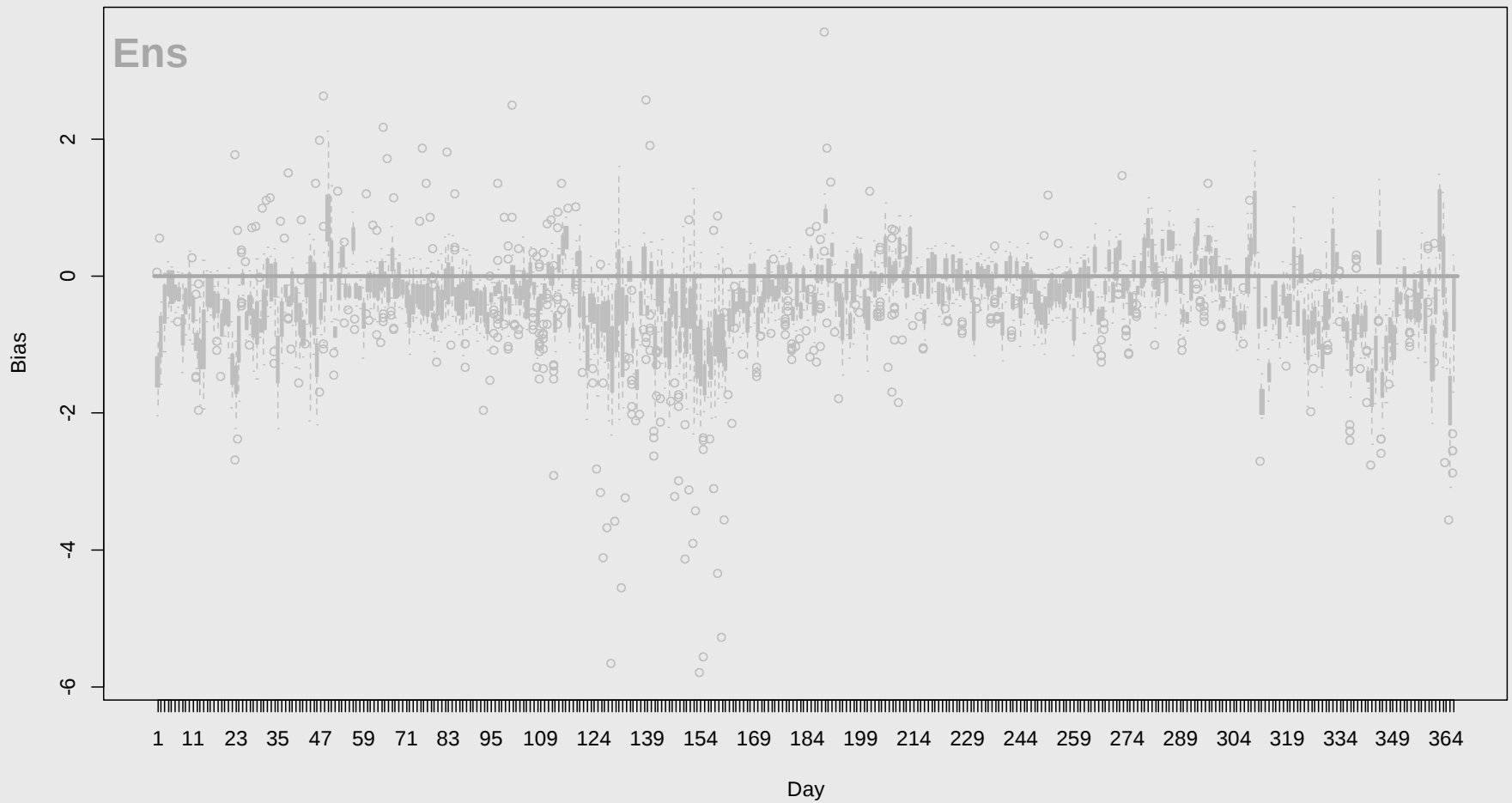
18700 -- 2008



# 18700 Oslo-Blindern

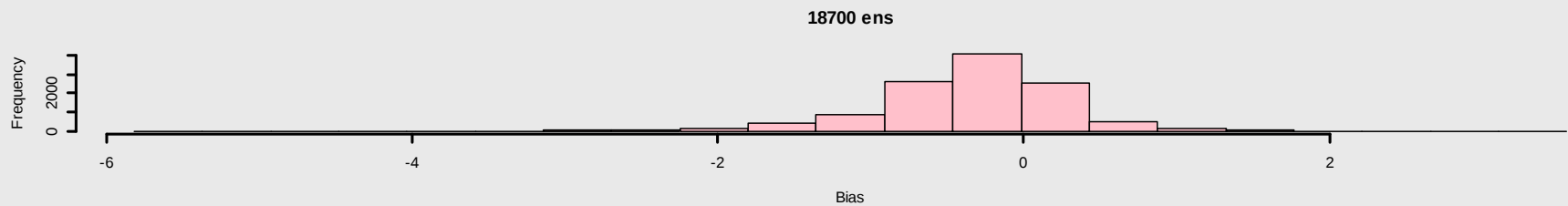
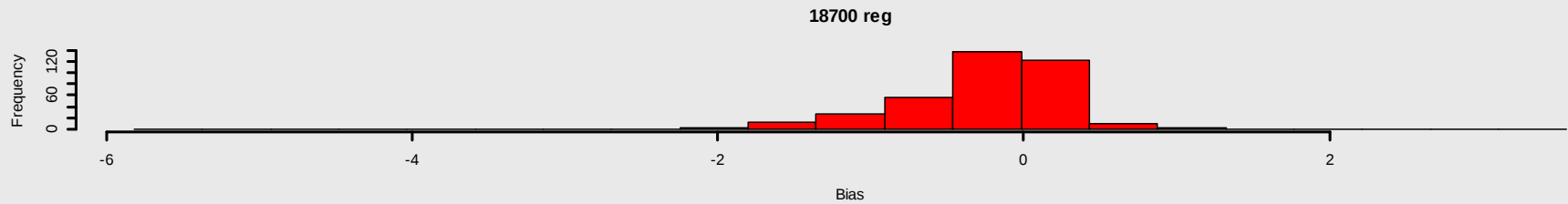
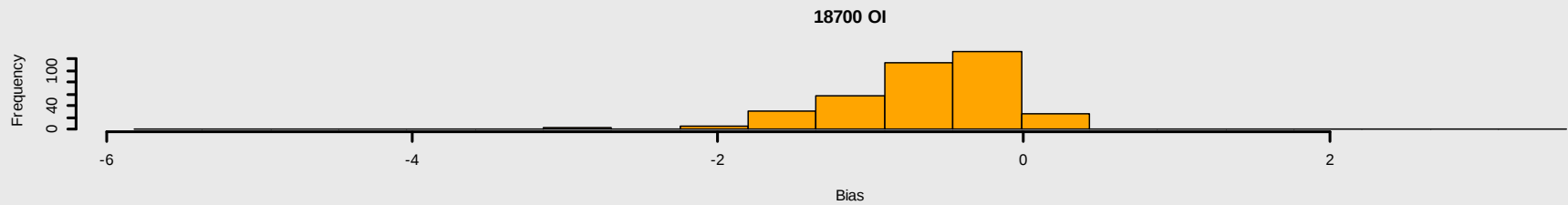
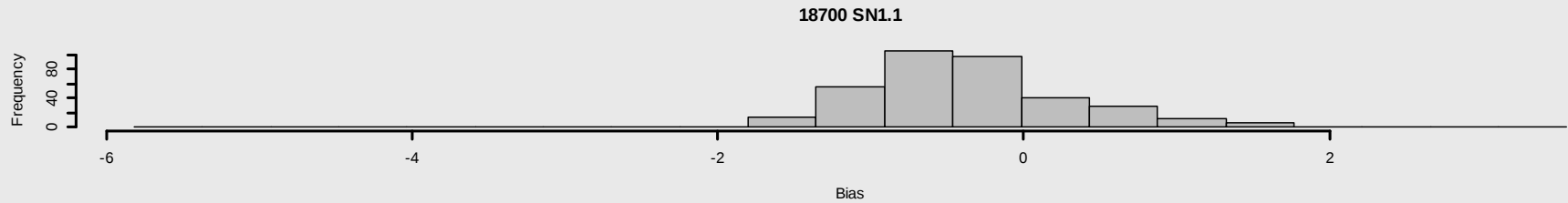
BIAS: Pred-Obs

18700 -- 2008



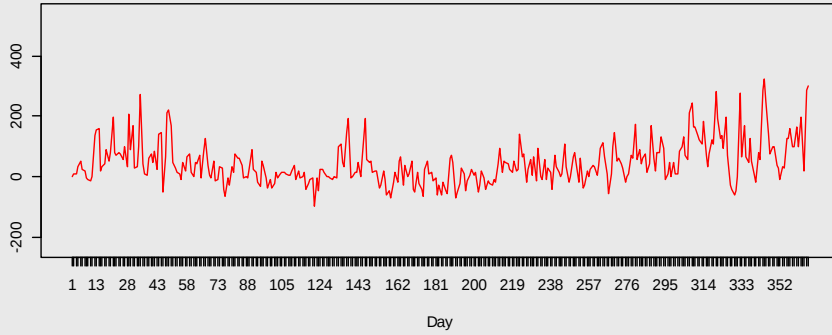
# 18700 Oslo-Blindern

## BIAS: Pred-Obs

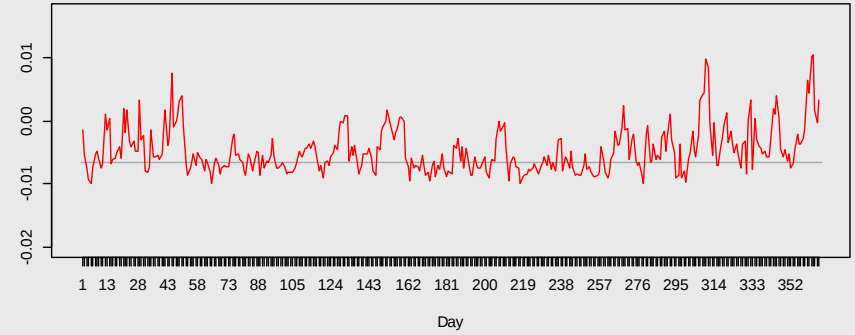


# 18700 Oslo-Blindern (2008)

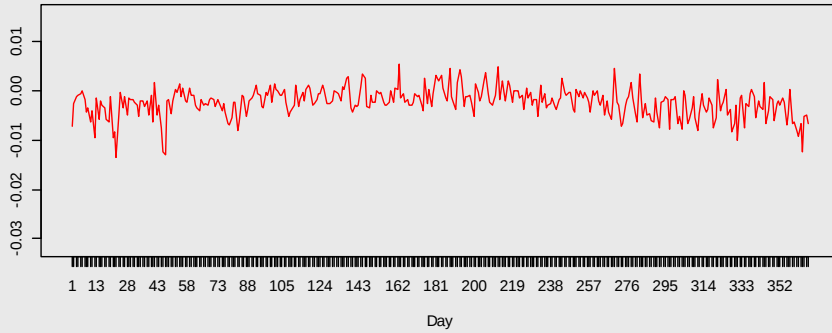
**const**



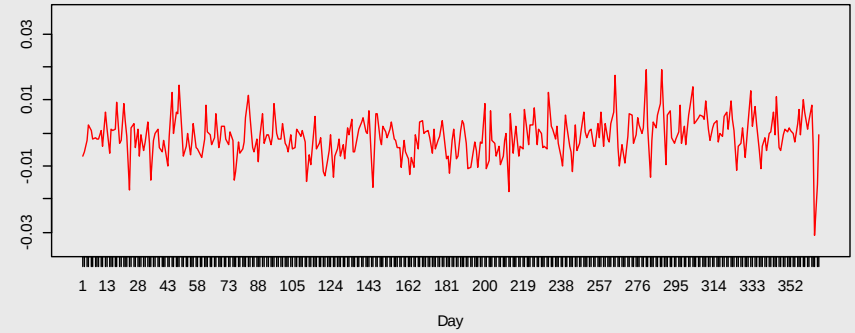
**Altitude**



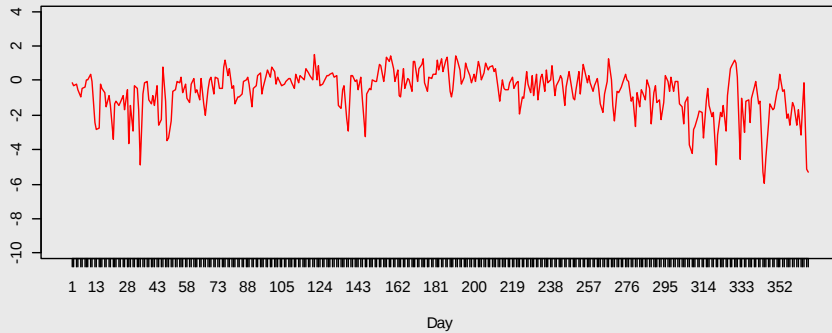
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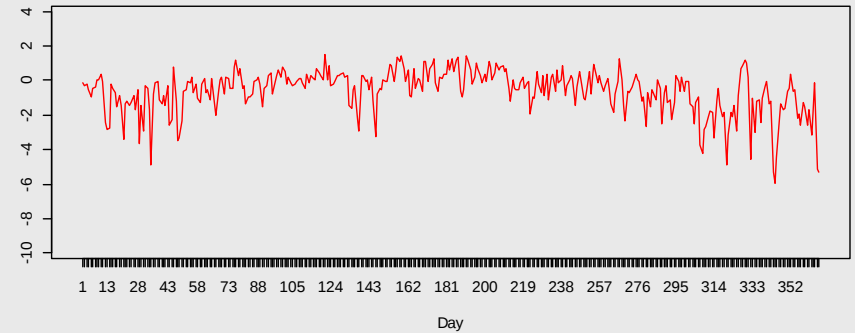
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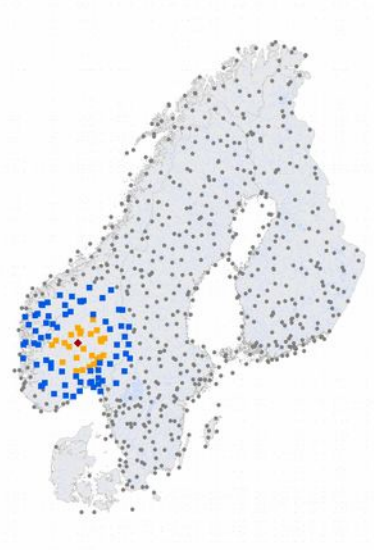


**Latitude**

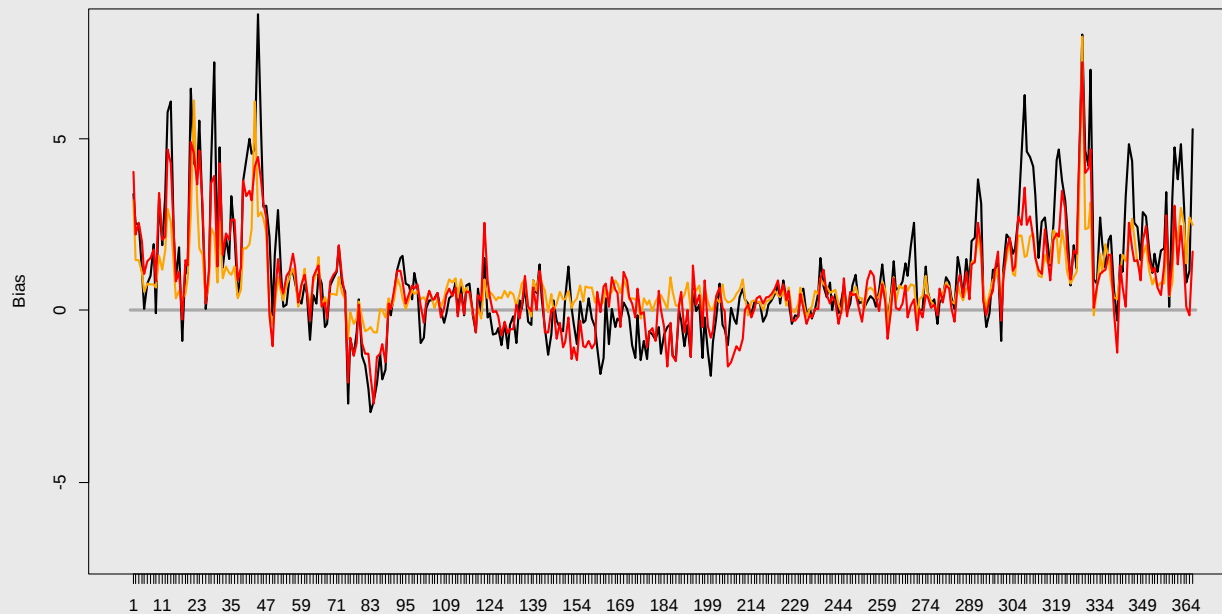


**Longitude**

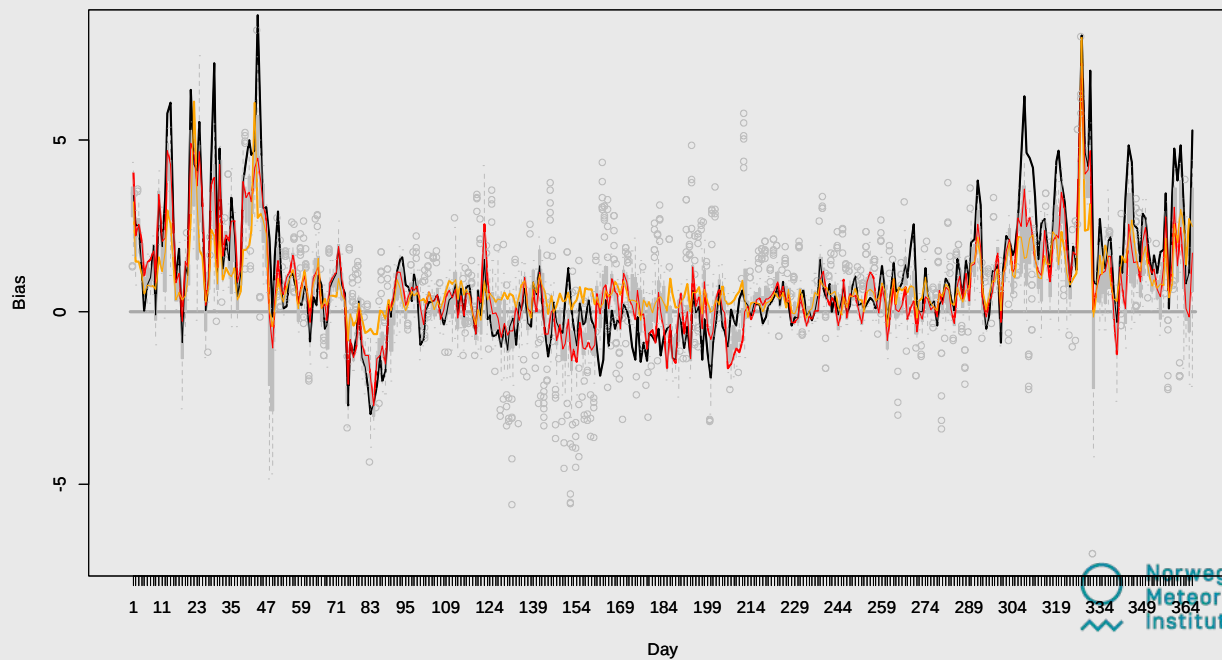


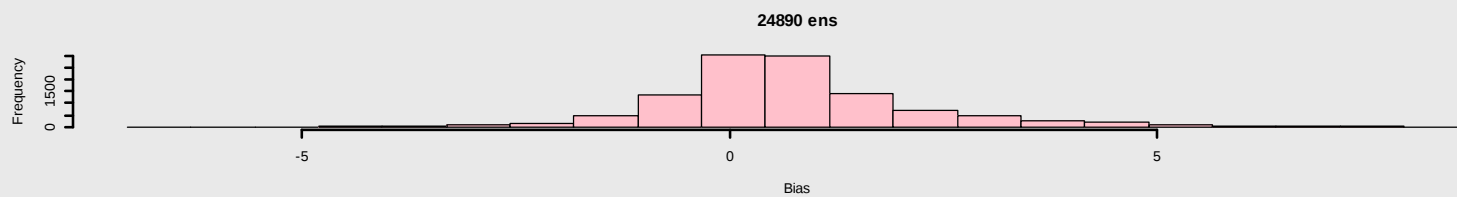
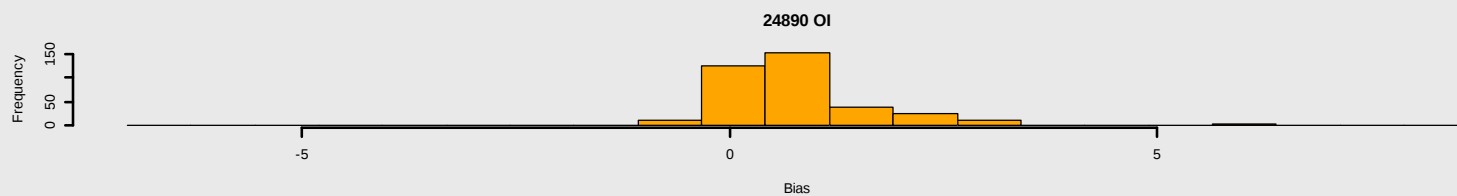
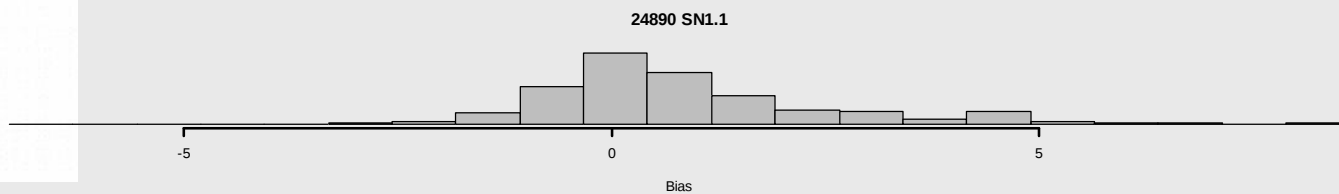
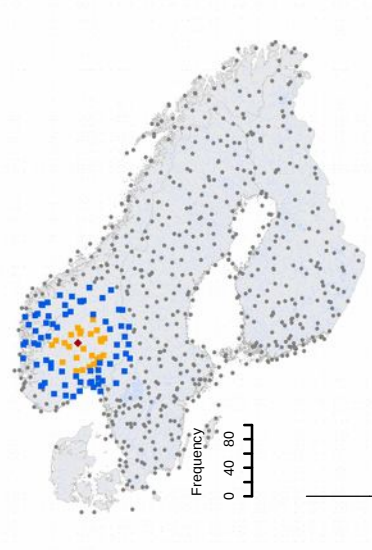


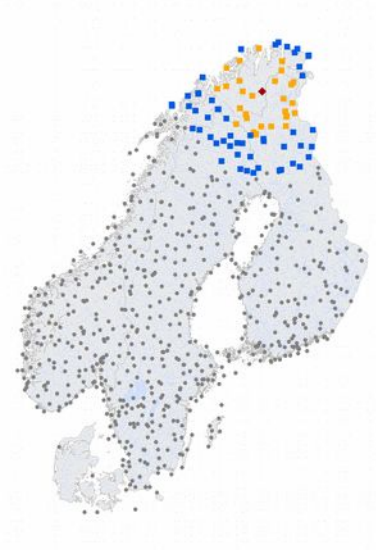
24890 -- 2008



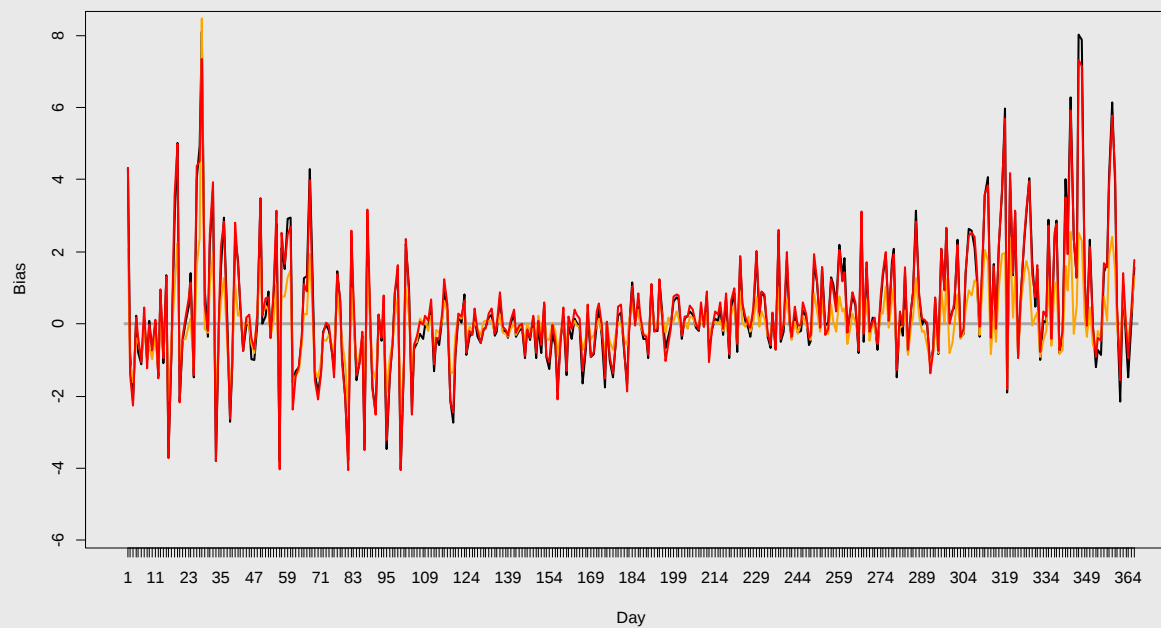
24890 -- 2008



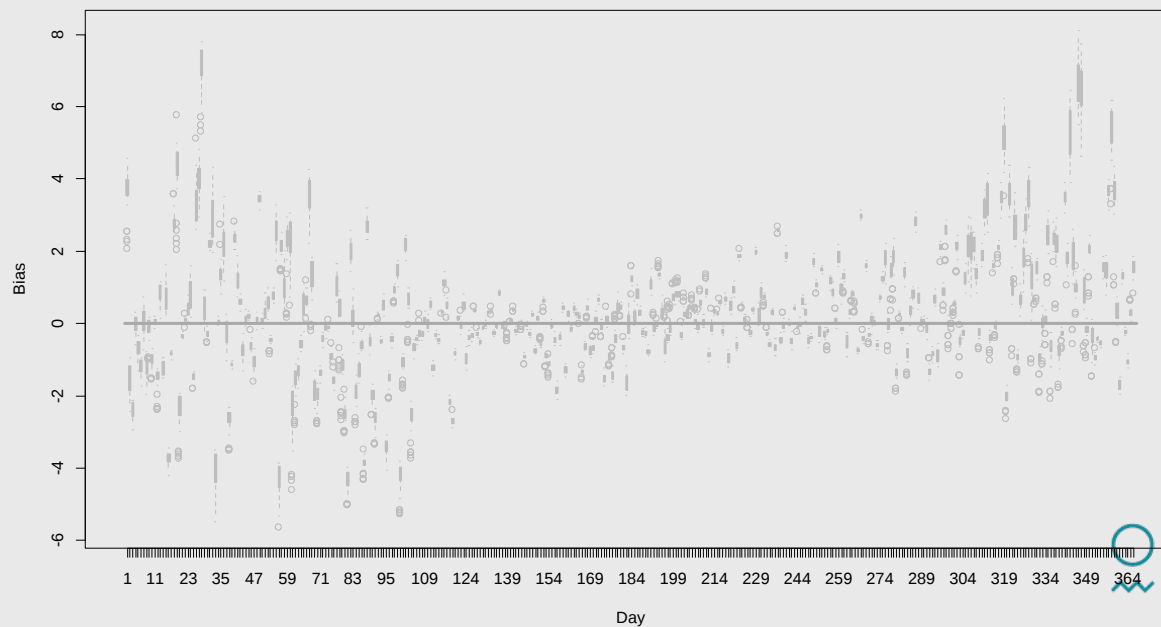




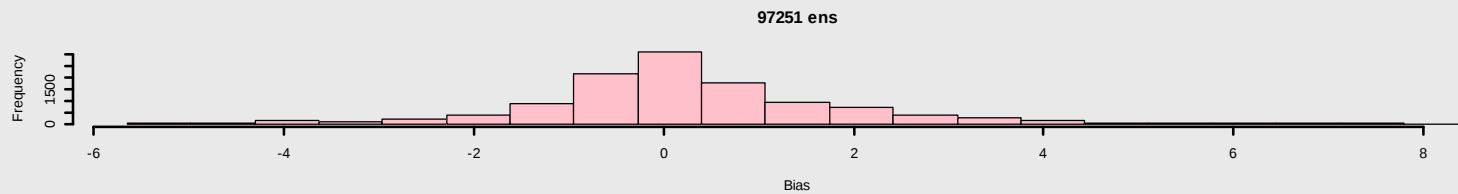
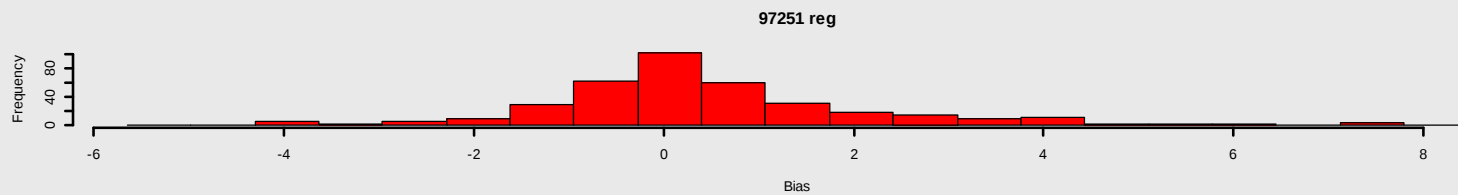
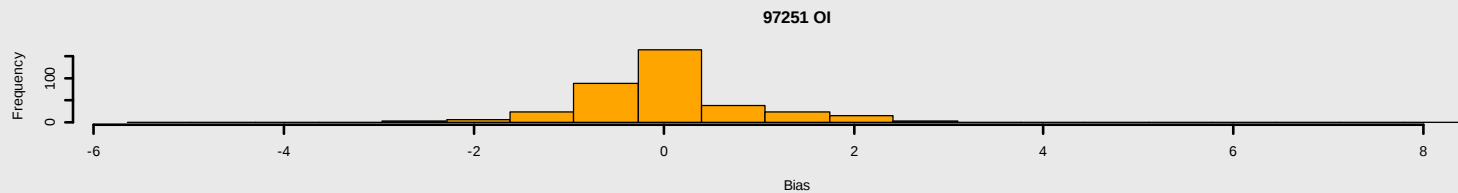
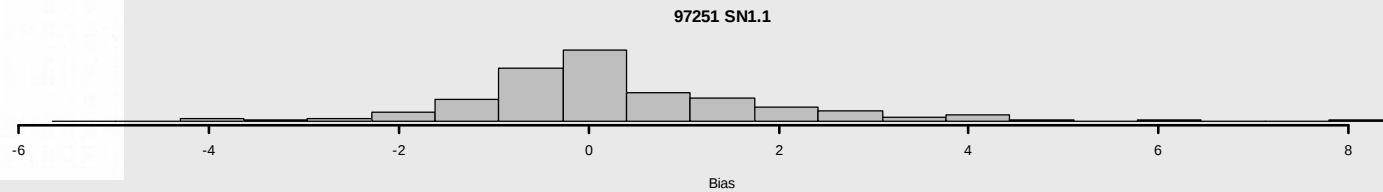
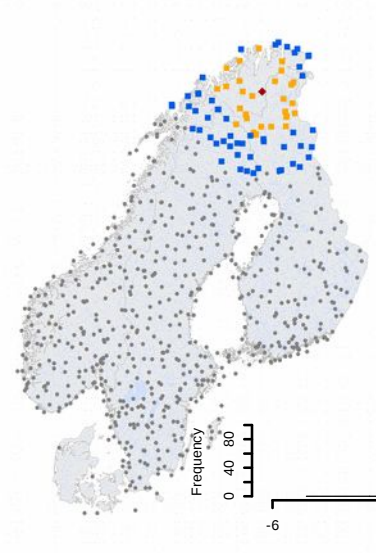
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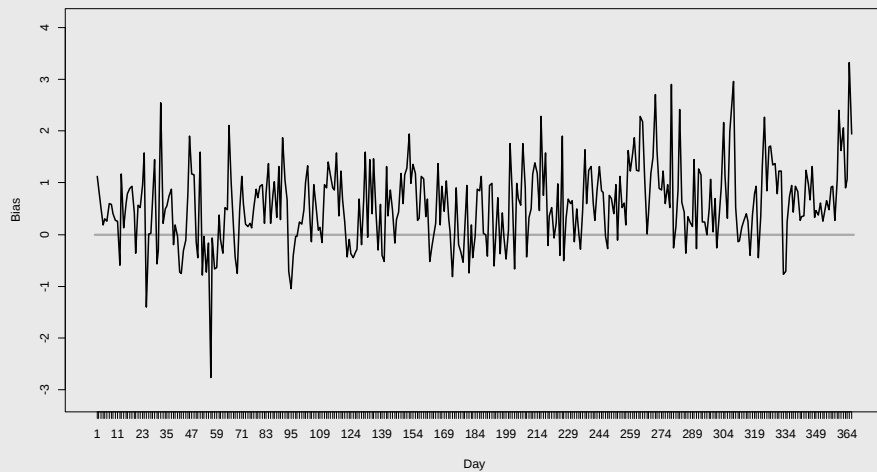
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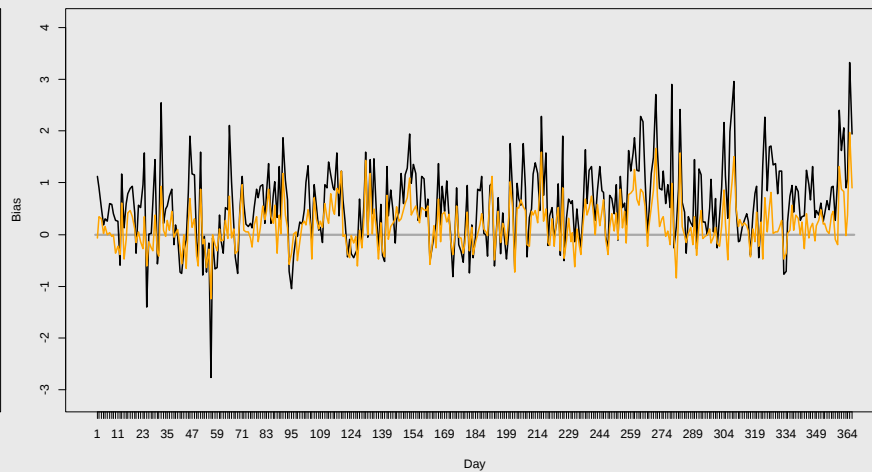




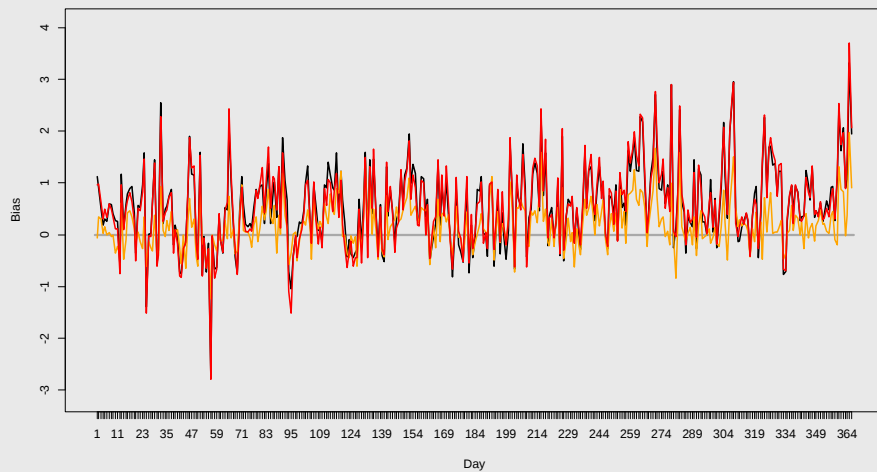
135351 -- 2008



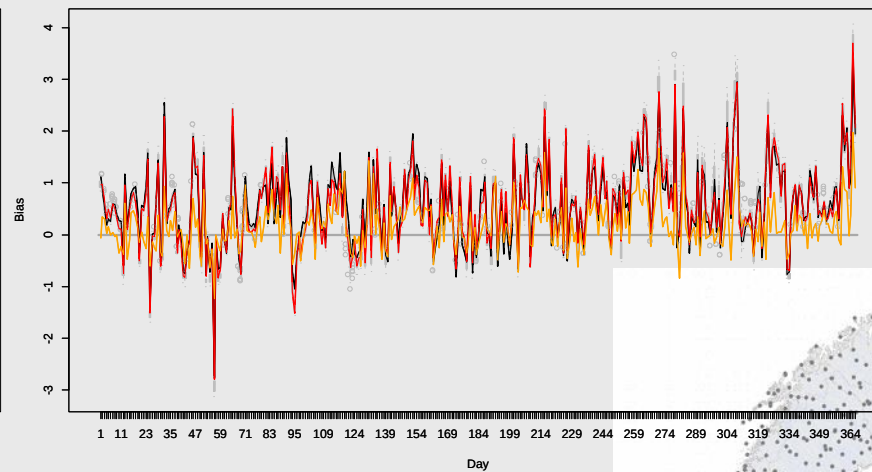
135351 -- 2008



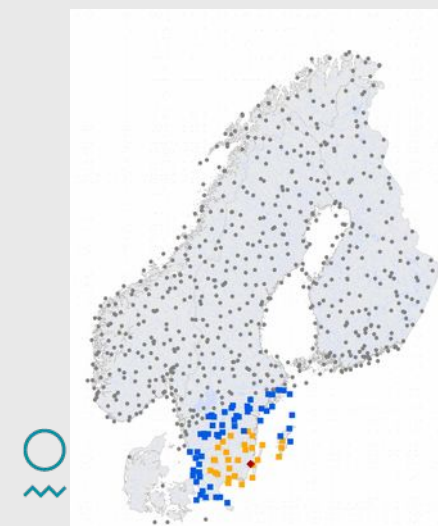
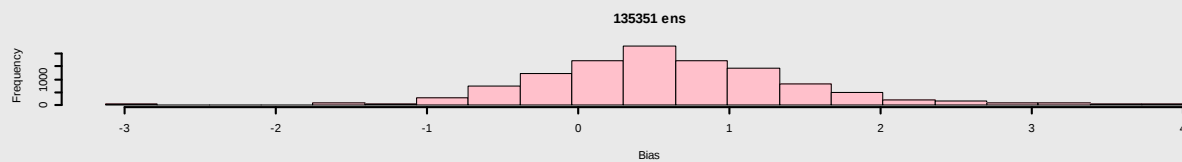
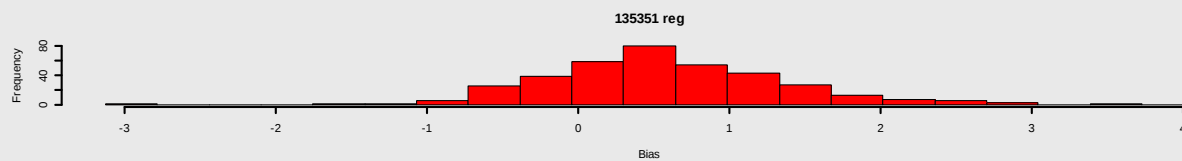
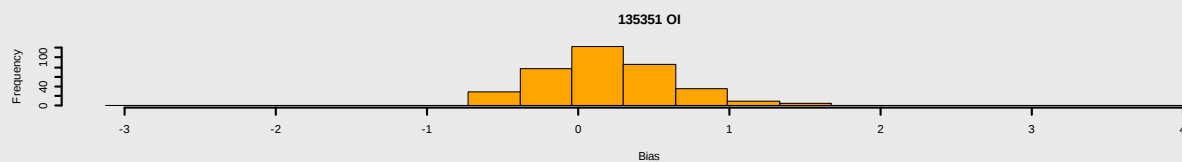
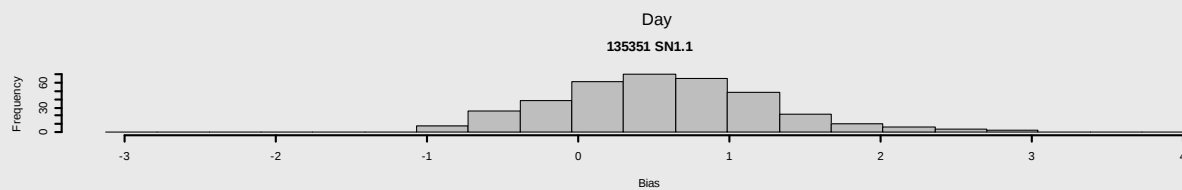
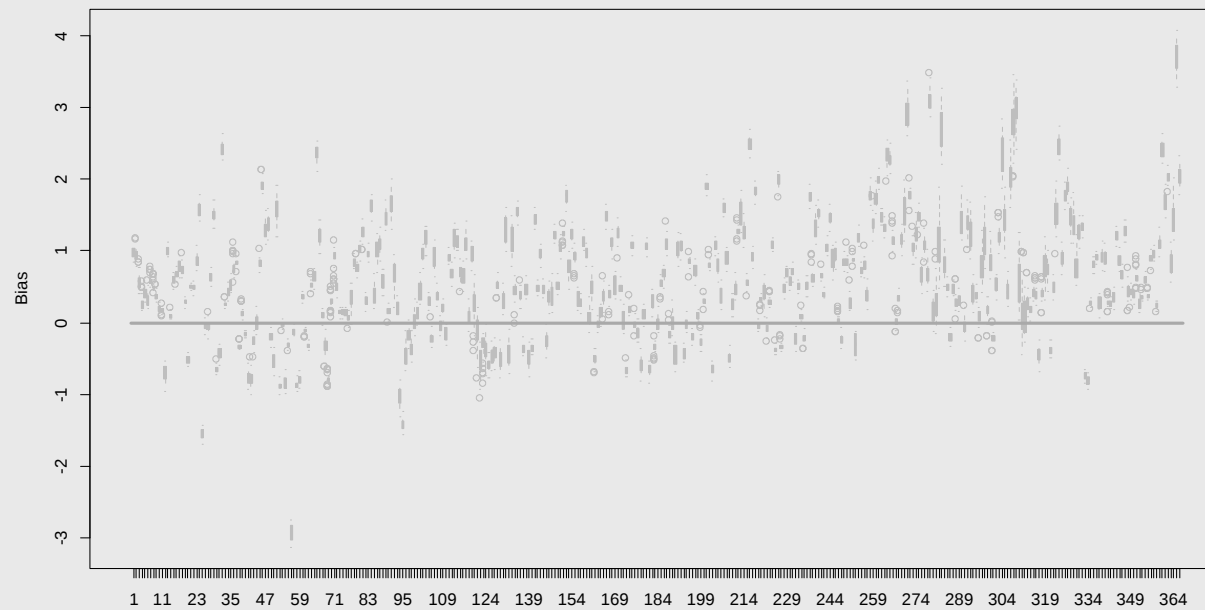
135351 -- 2008



135351 -- 2008



135351 -- 2008



# Sensitivity of external predictors

- Stepwise regression was applied in the daily regional analysis in order to retain only significant predictors for the estimation of the background field.

# 1. January

Z



Zmean



Zmin



Lat



Long

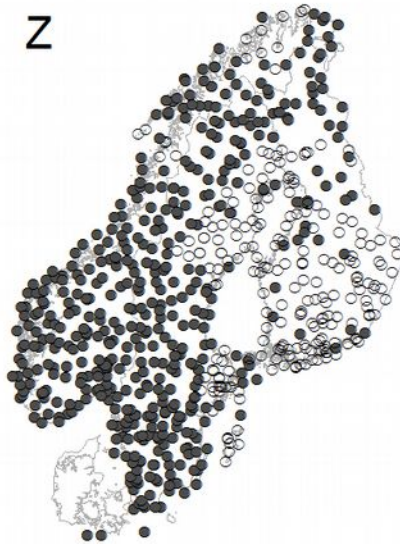


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# 1.July

Z



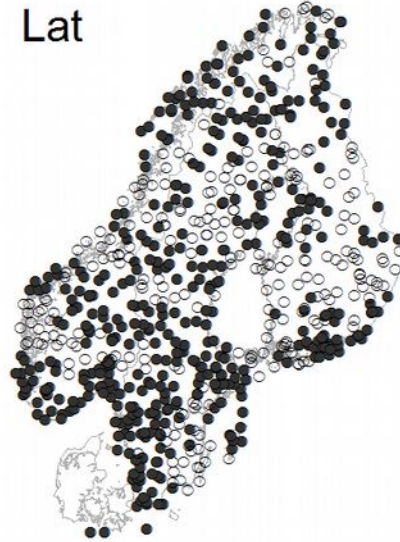
Zmean



Zmin



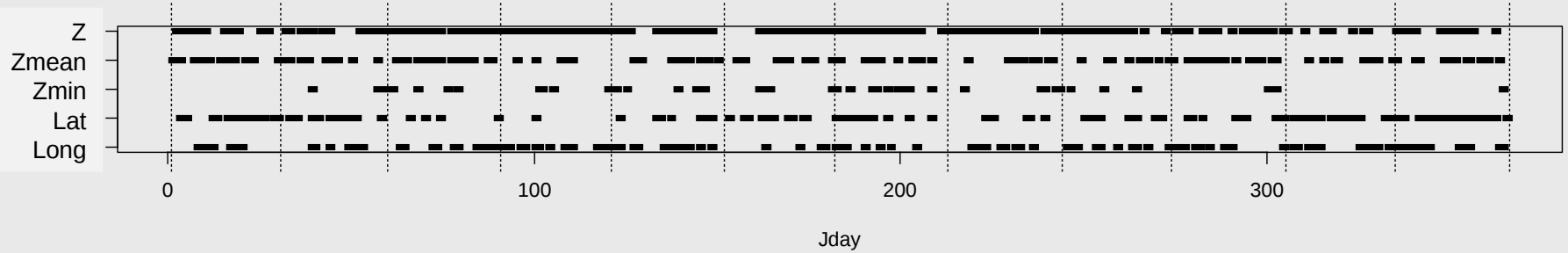
Lat



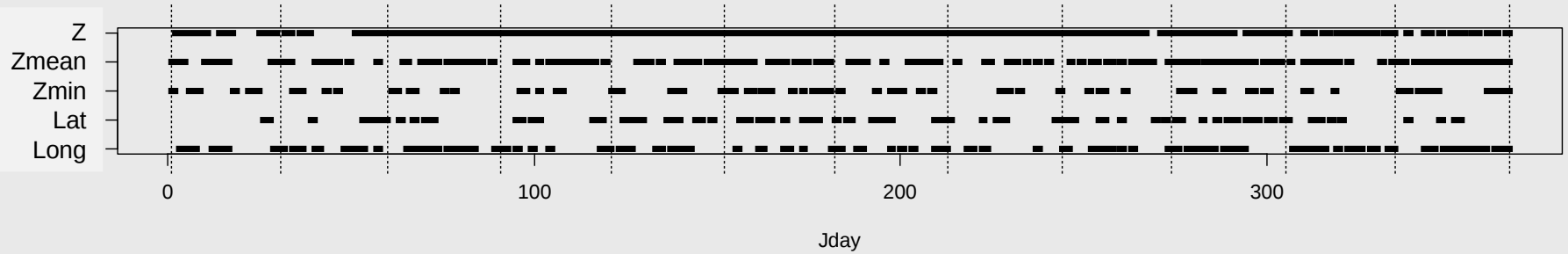
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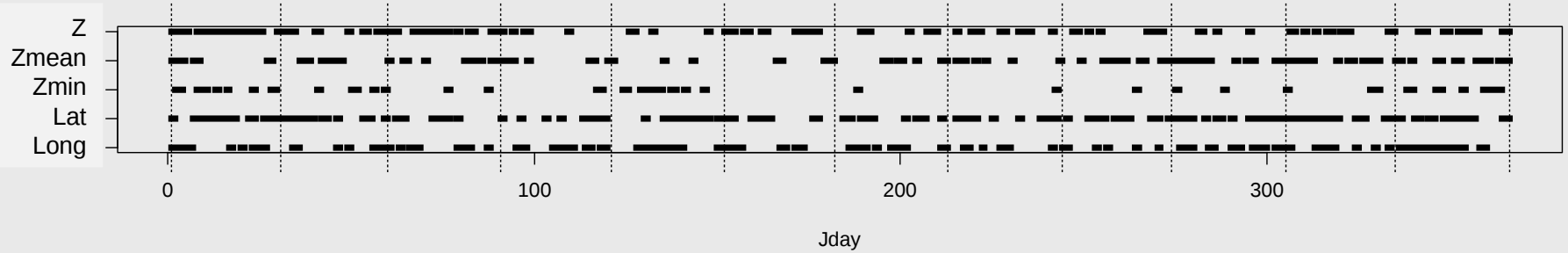
18700



24890

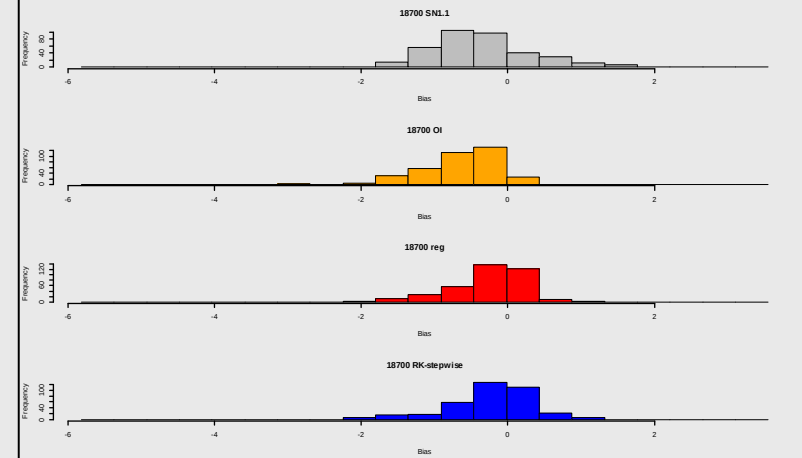
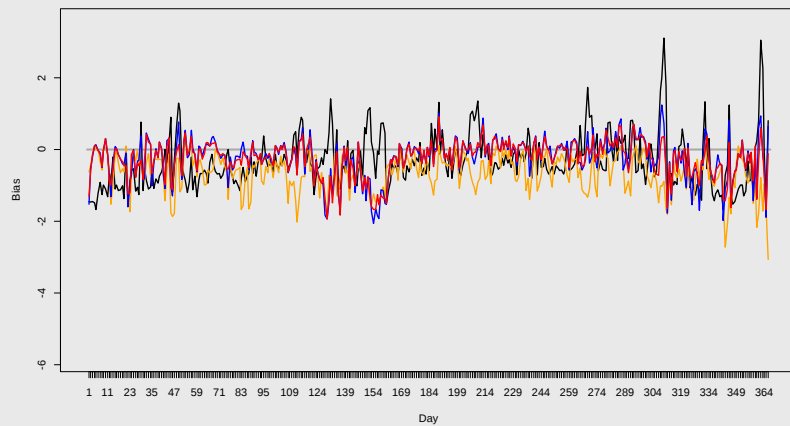


135351

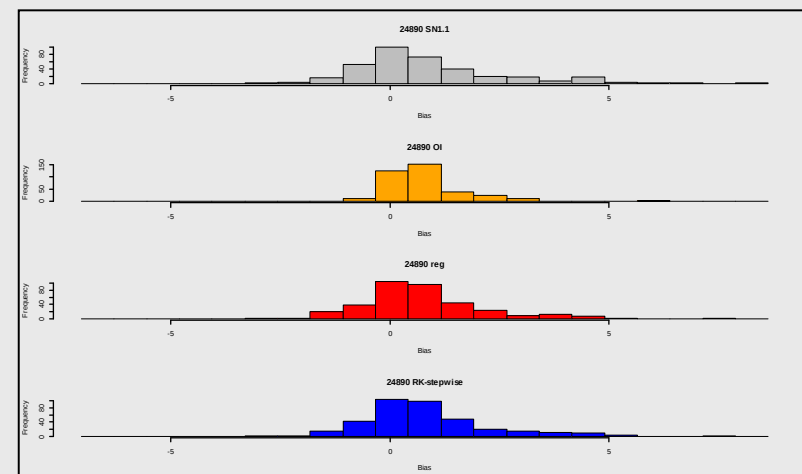
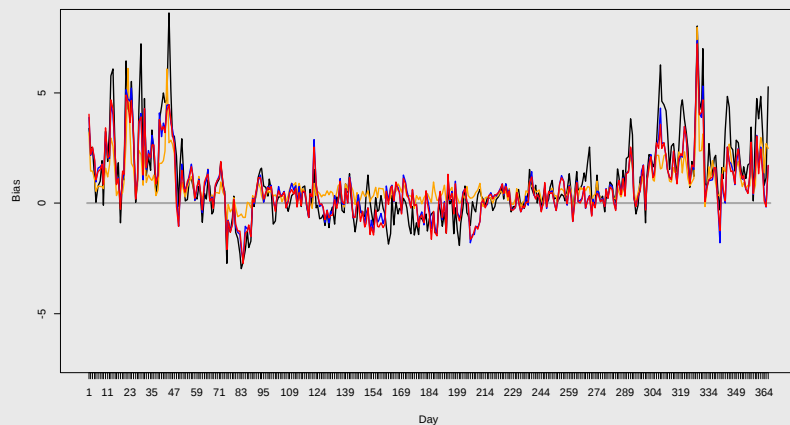




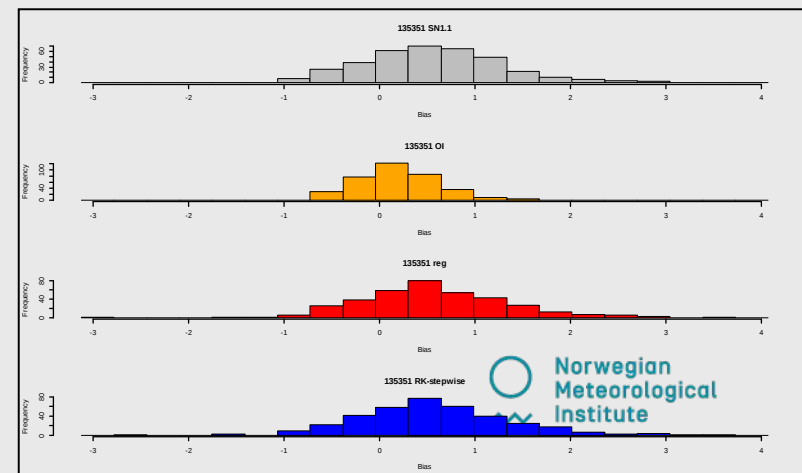
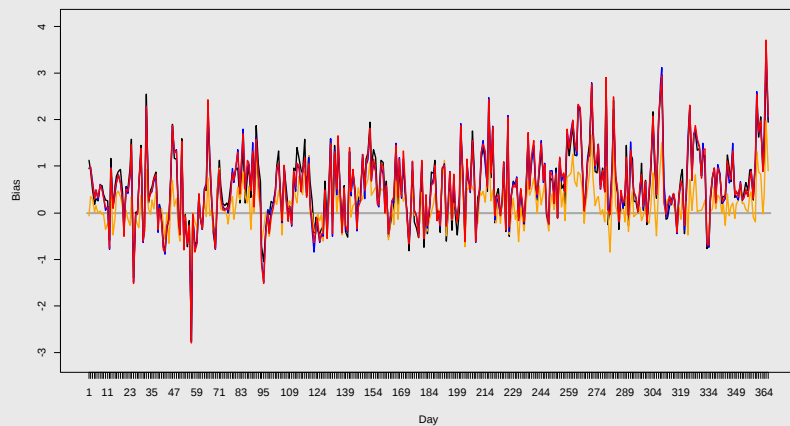
18700 -- 2008



24890 -- 2008



135351 -- 2008



# Conclusions, and further work....

- Large temporal and spatial variations in  
Weights  
Significance  
of external predictors
- Selection of predictors must **reflect regional conditions**.  
More work is needed to identify the best representation of these
- Smart algorithms for regional averaging is needed  
The OI-approach shows that this is promising
- A smart combination of horizontal and vertical distances is needed  
How to condition a robust ensemble approach?  
Are «background ensembles» the only way?  
.....