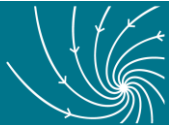# Bias correction of boundary data in regional modelling

Marie Pontoppidan and Erik W. Kolstad
Uni Research & Bjerknes Centre for Climate Research

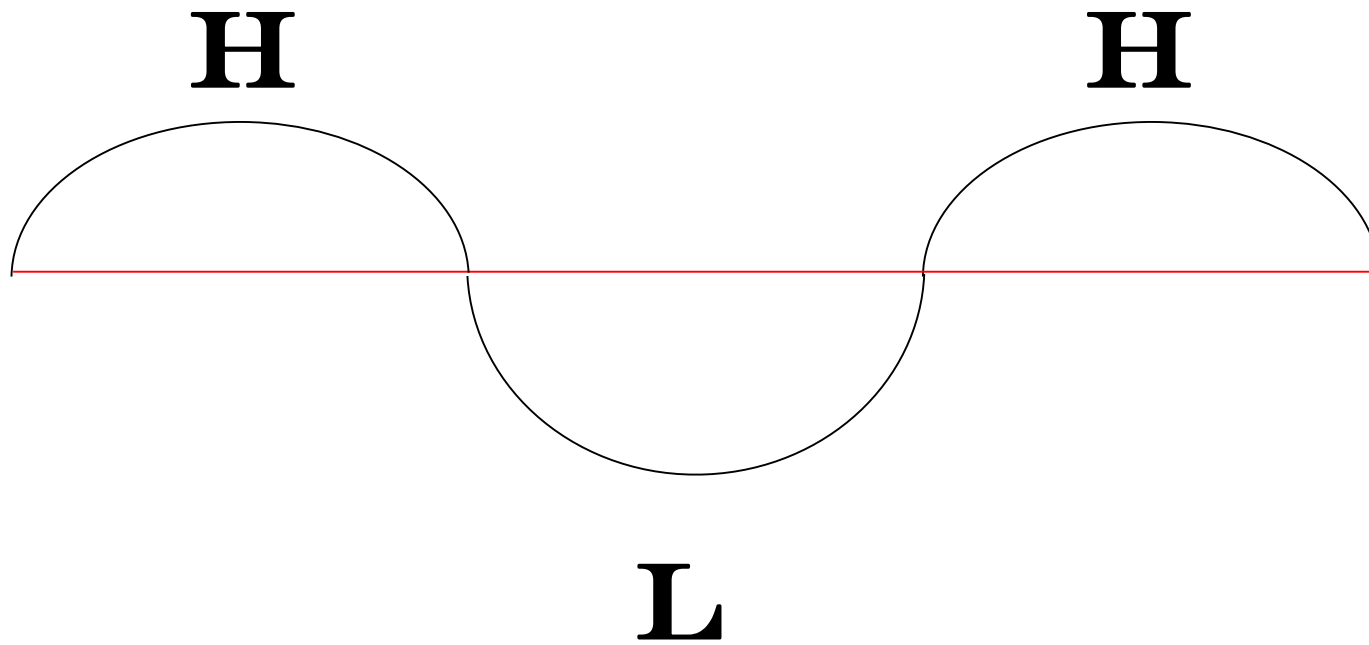uni Research

BJERKNES CENTRE
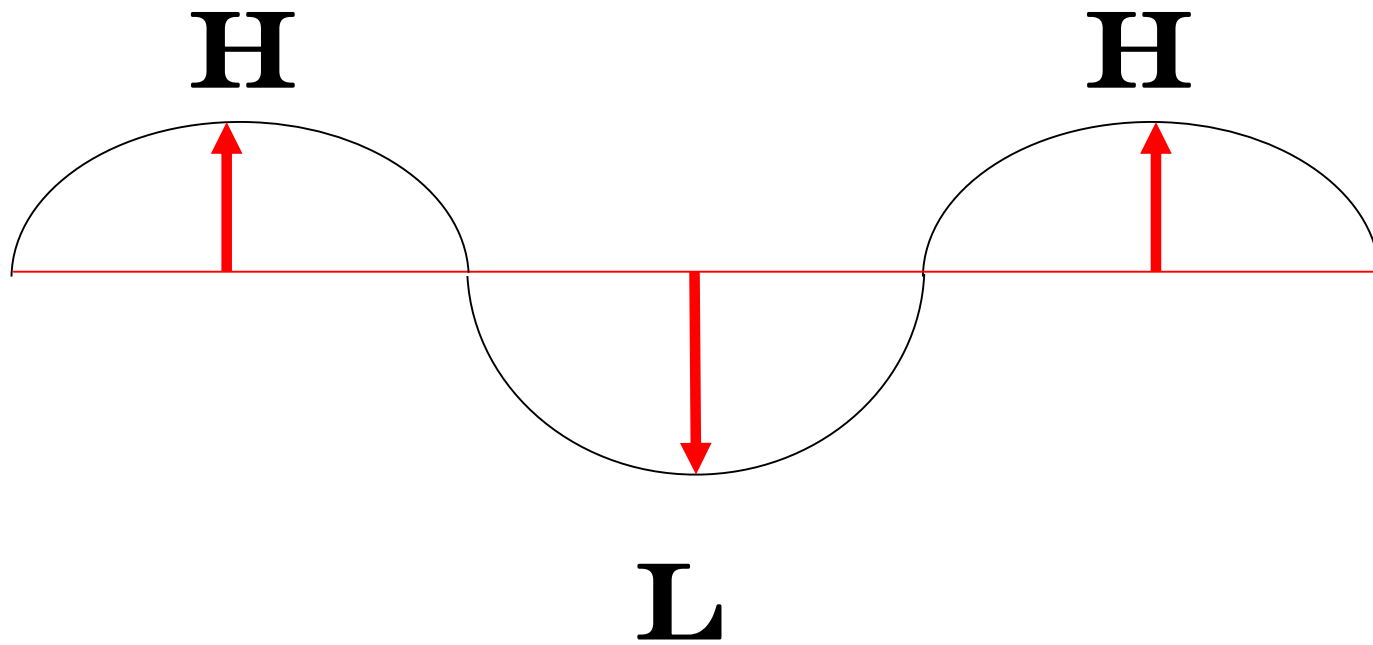for Climate Research

Motivation

- HORDAKLIM

- R3 (Relevant, reliable and robust local-scale climate projections for Norway)
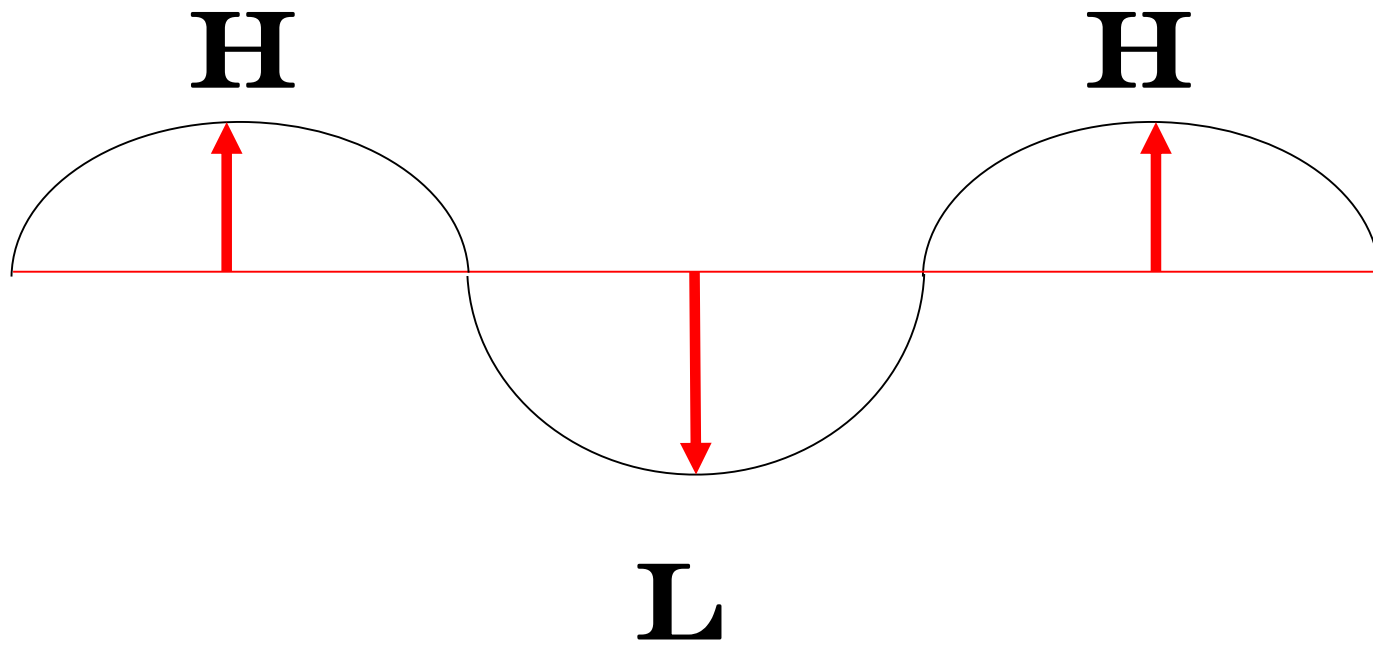

- Stakeholder included projects

Sea level pressure (SLP)

Sea level pressure (SLP)
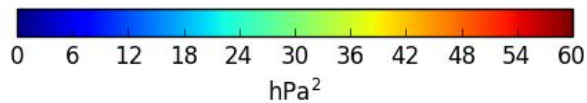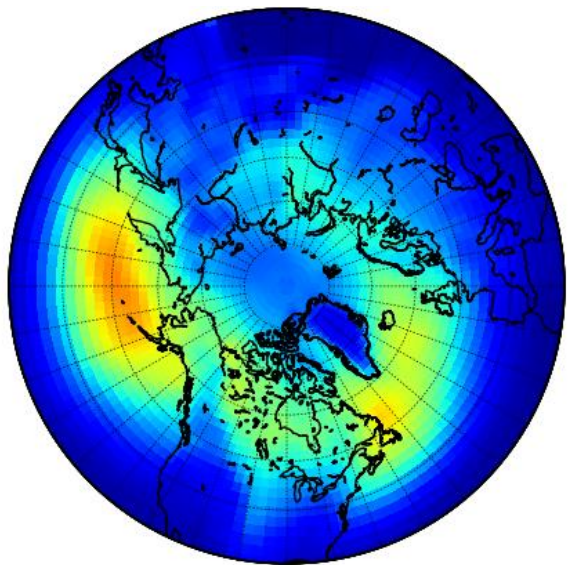
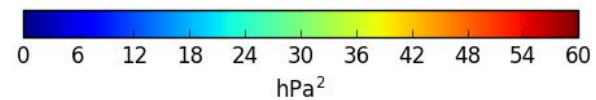# Sea level pressure (SLP)

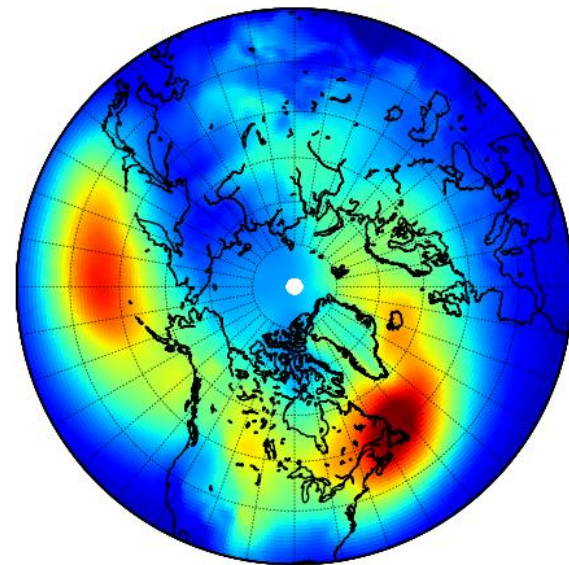➢ More low pressure systems ⇒ Higher variability

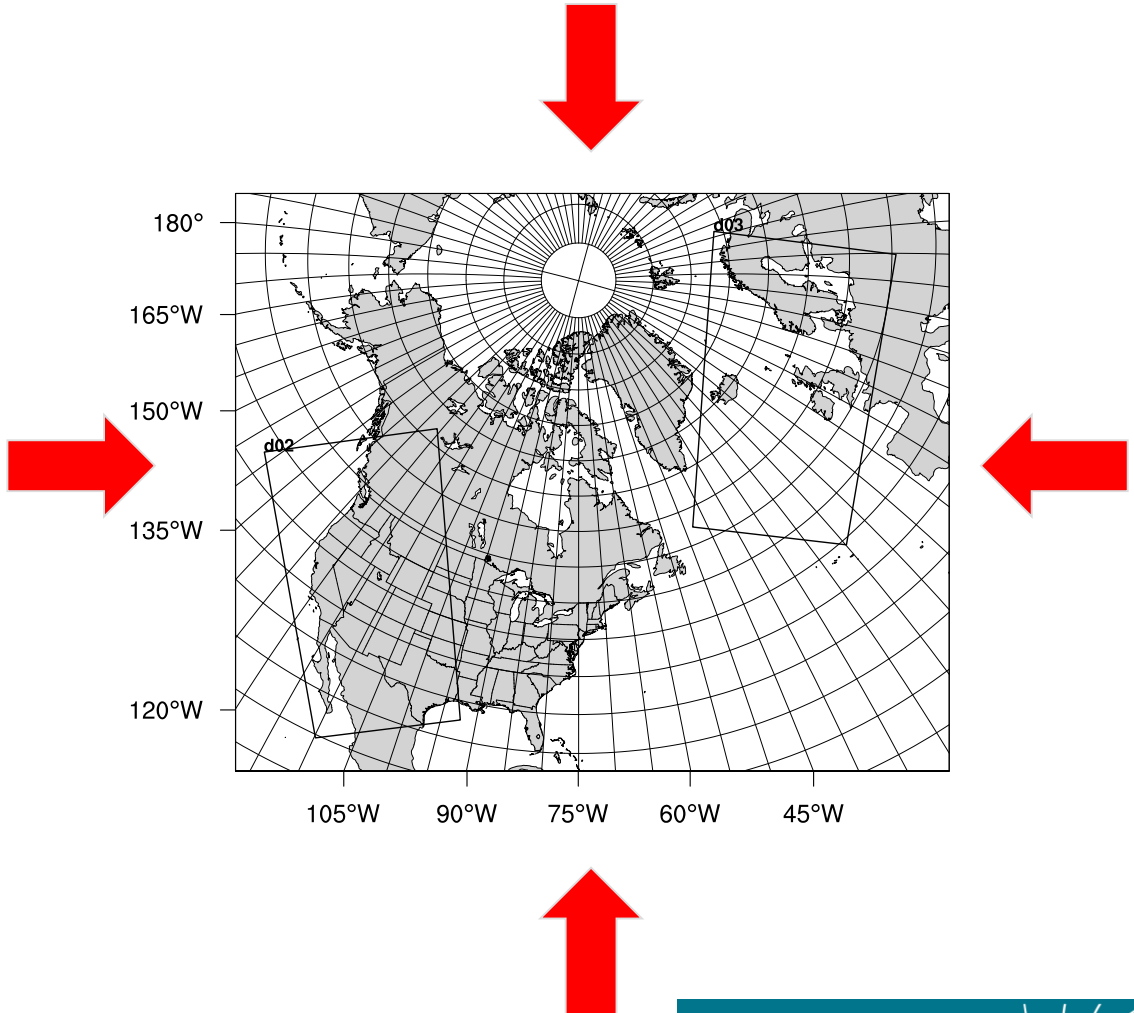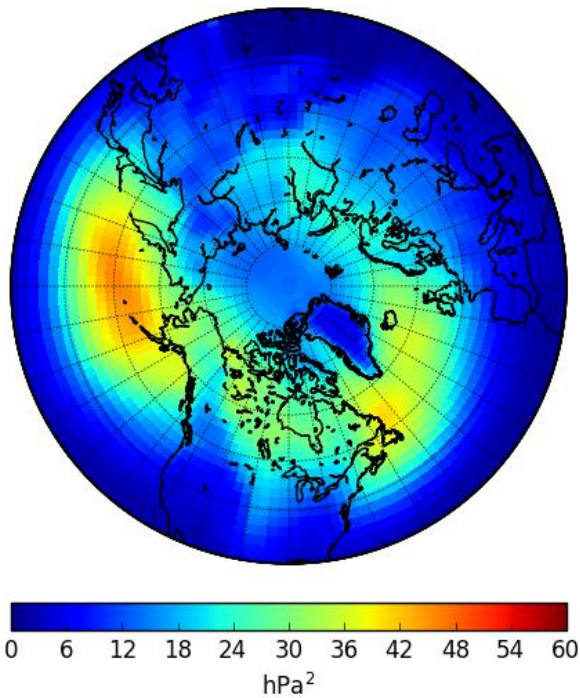# 30y mean pressure variability

NorESM surface pressure

ERA-Interim SLP

Dynamical downscaling

Bias correction

$$ERAI_p = \overline{ERAI_p} + ERAI'_p$$

Bias correction

$$ERAI_p = \overline{ERAI_p} + ERAI_p'$$

$$NorESM_p = \overline{NorESM_p} + NorESM_p'$$

Bias correction

$$ERAI_p = \overline{ERAI_p} + ERAI_p'$$

$$NorESM_p = \overline{NorESM_p} + NorESM_p'$$

$$NorESM_{BC} = \overline{ERAI_p} + NorESM_p'$$

Bias correction

$$ERAI_p = \overline{ERAI_p} + ERAI_p'$$

$$NorESM_p = \overline{NorESM_p} + NorESM_p'$$

$$NorESM_{BC} = \overline{ERAI_p} + NorESM_p'$$

$$NorESM_{BC} = NorESM_f - \overline{NorESM_p} + \overline{ERAI_p}$$

Bias correction

$$ERAI_p = \overline{ERAI_p} + ERAI_p'$$

$$NorESM_p = \overline{NorESM_p} + NorESM_p'$$

$$NorESM_{BC} = \overline{ERAI_p} + NorESM_p'$$

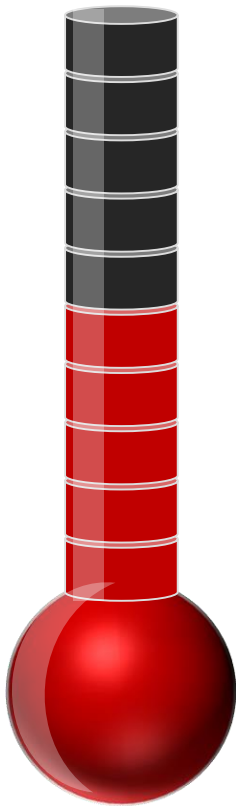$$NorESM_{BC} = NorESM_f - \overline{NorESM_p} + \overline{ERAI_p}$$

- ✓ Mean is bias corrected
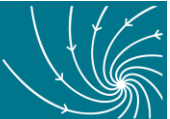- ✓ Future variability is okay
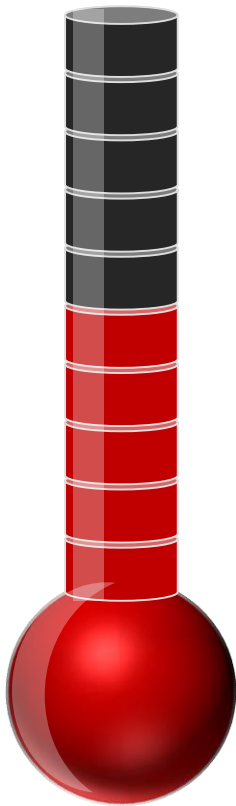
Bruyère et al. 2014

Practical example

Mean NorESM

+ 5°

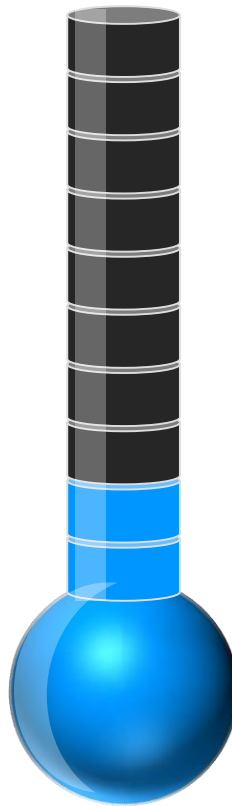# Practical example

Mean NorESM

Mean ERA-I

+ 5°
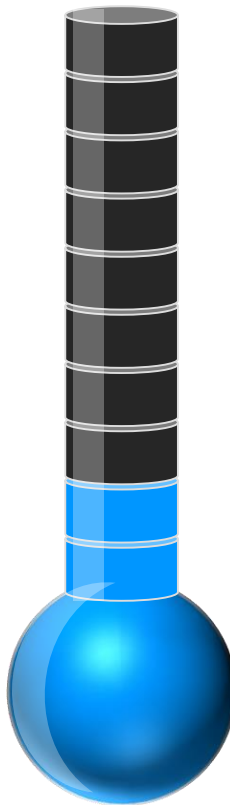
+ 2°

Practical example

Mean NorESM
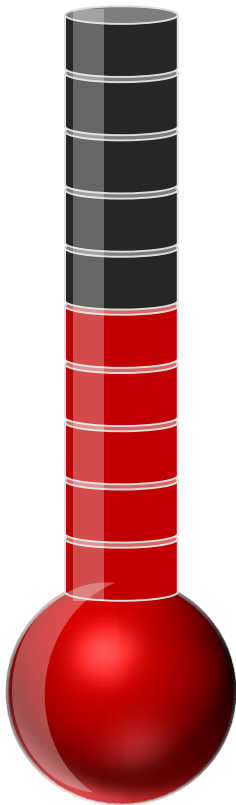
Mean ERA-I

$$Bias = \overline{NorESM} - \overline{ERAI}$$
$$5° - 2° = 3°$$

$$NorESM_{BC} = NorESM_f - 5° + 2°$$

+ 5°

+ 2°
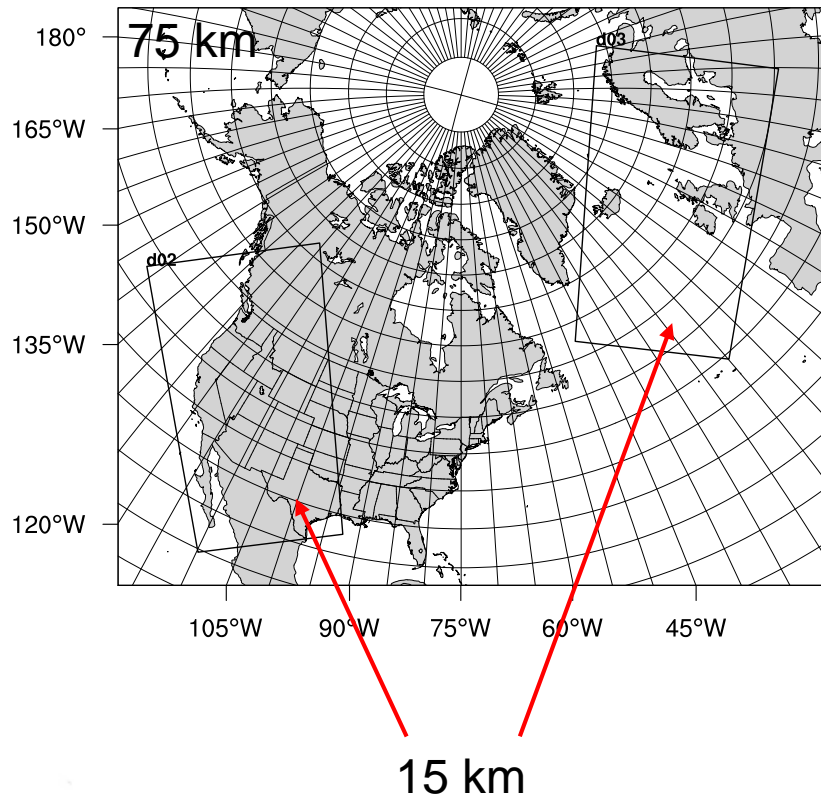
What differences does it make?

DJF 98-99 SST BC - NBC
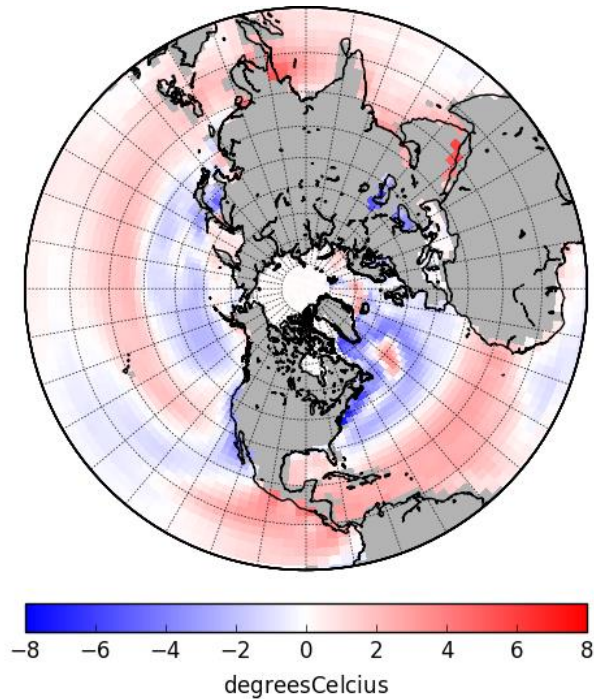
DJF 98-99 TT 10 hPa BC - NBC
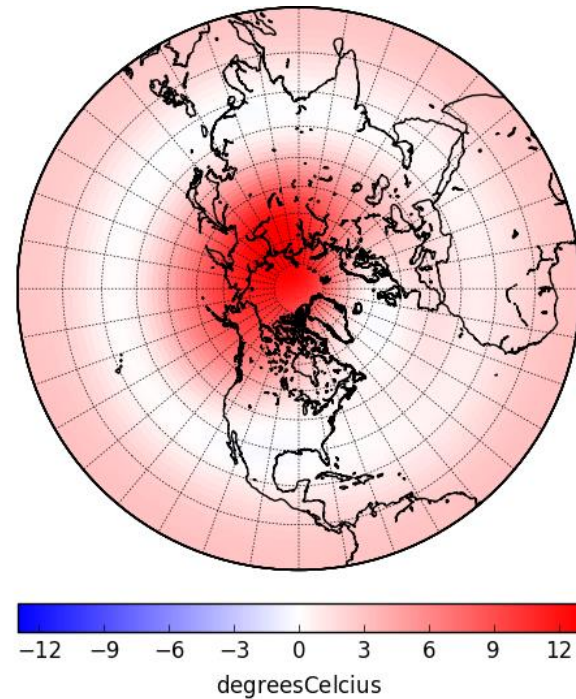
Regional modelling

Two simulations
- WRF v. 3.7.1
- 75 km & 15 km resolution
- Two-way feedback
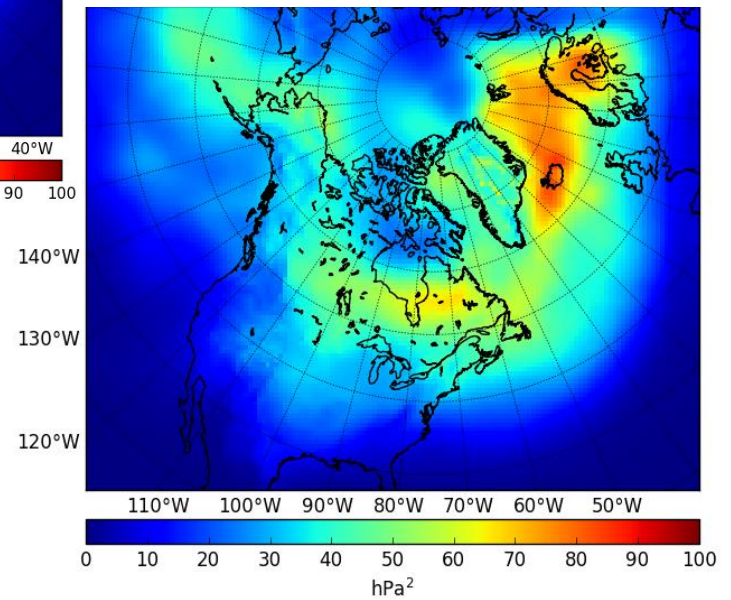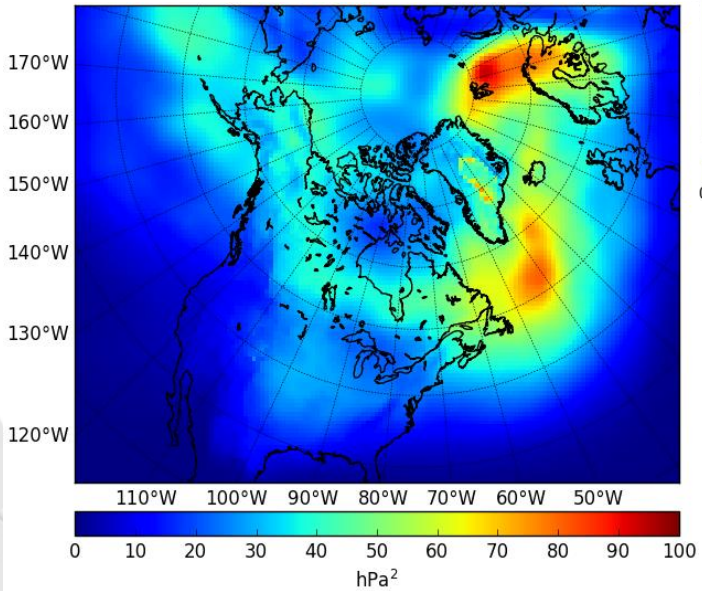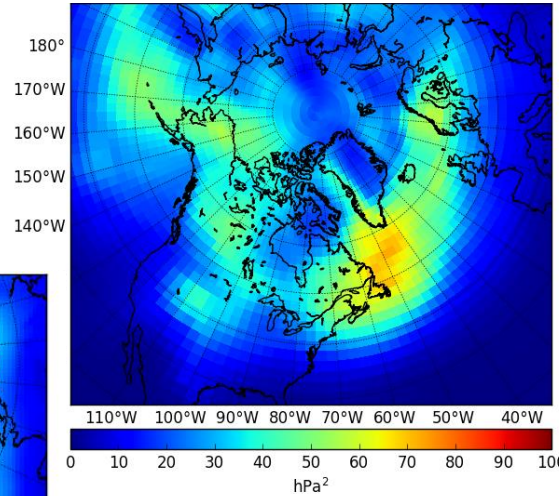- DJF 1998 – 1999
- Bias corrected LBC
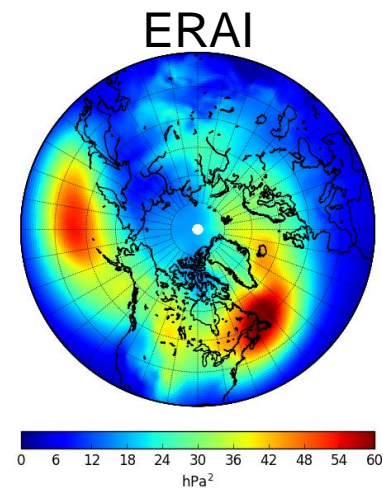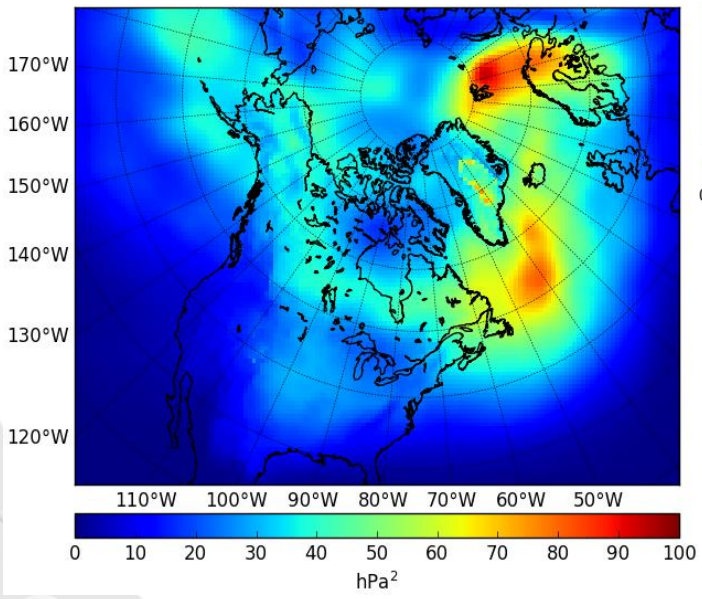- Not bias corrected LBC

North Atlantic storm tracks

North Atlantic storm tracks
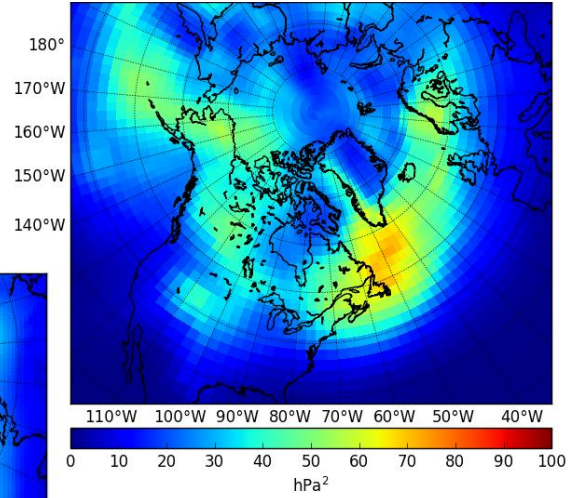
Precipitation
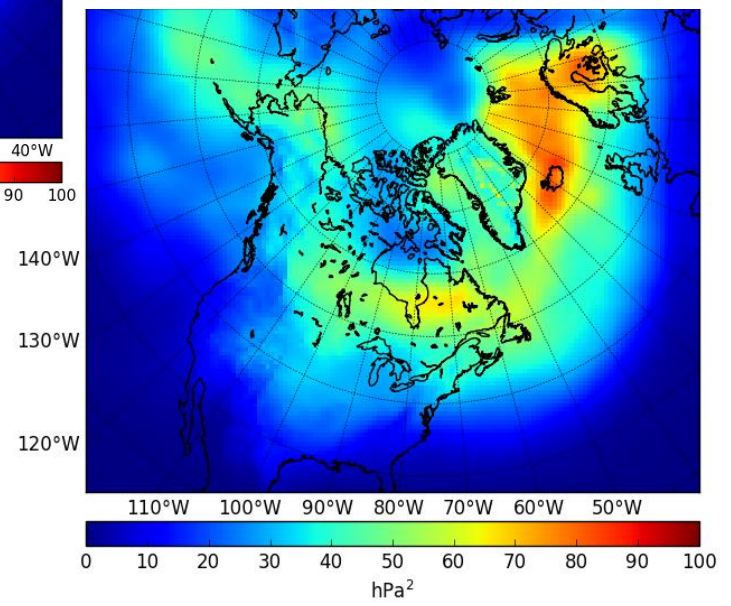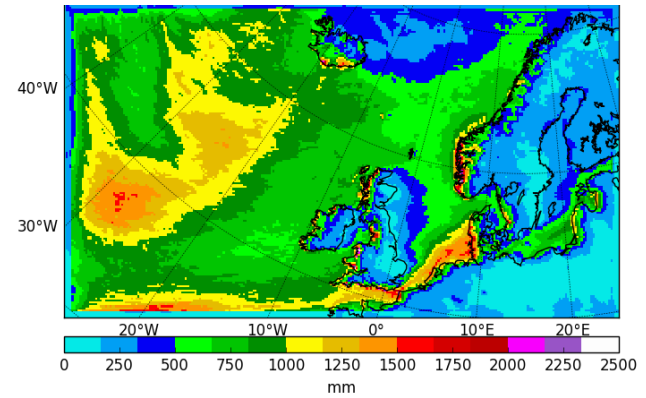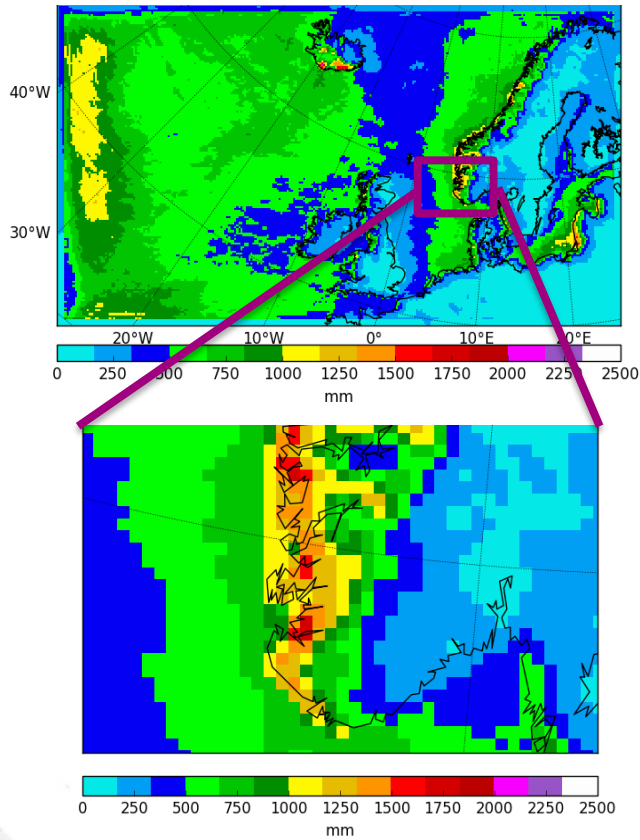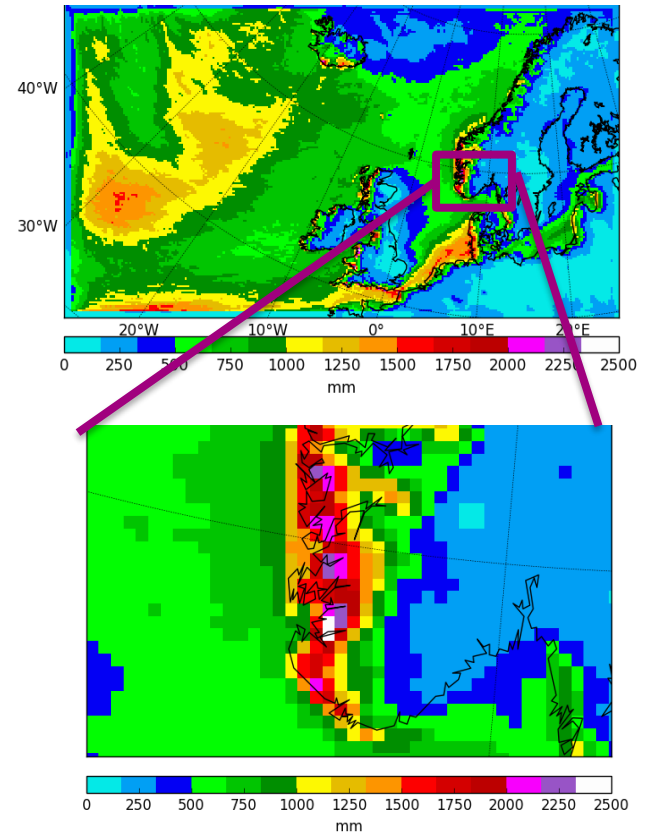
BC

NBC

Precipitation
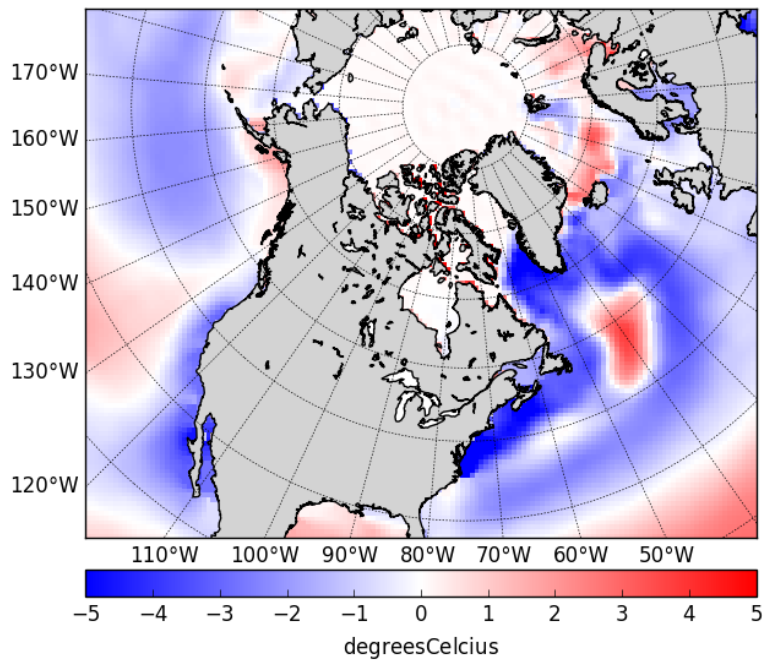
Why?

Difference in SST BC - NBC

- BC cools ocean
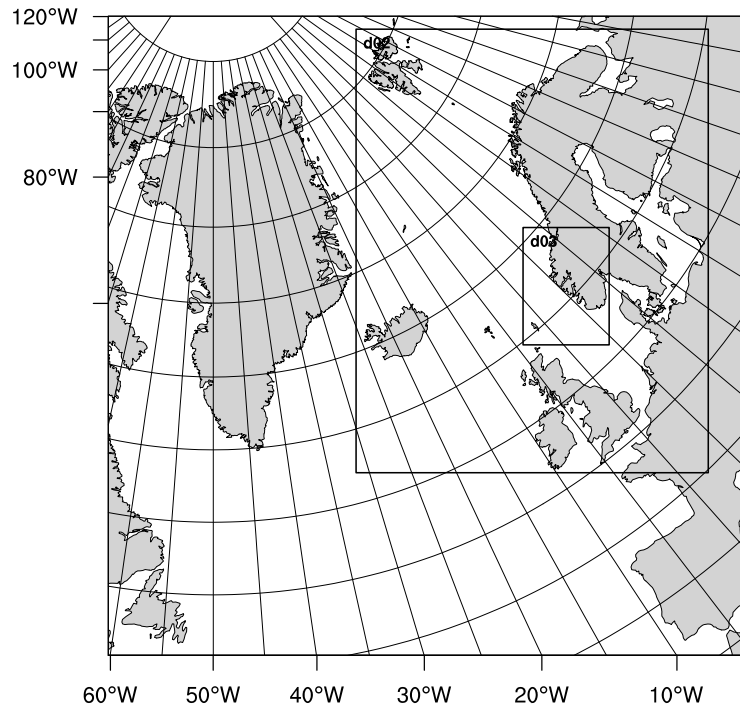- Reduce in atm. moisture?

Onwards from here

- Investigate multiple years

Onwards from here

- ## Investigate multiple years
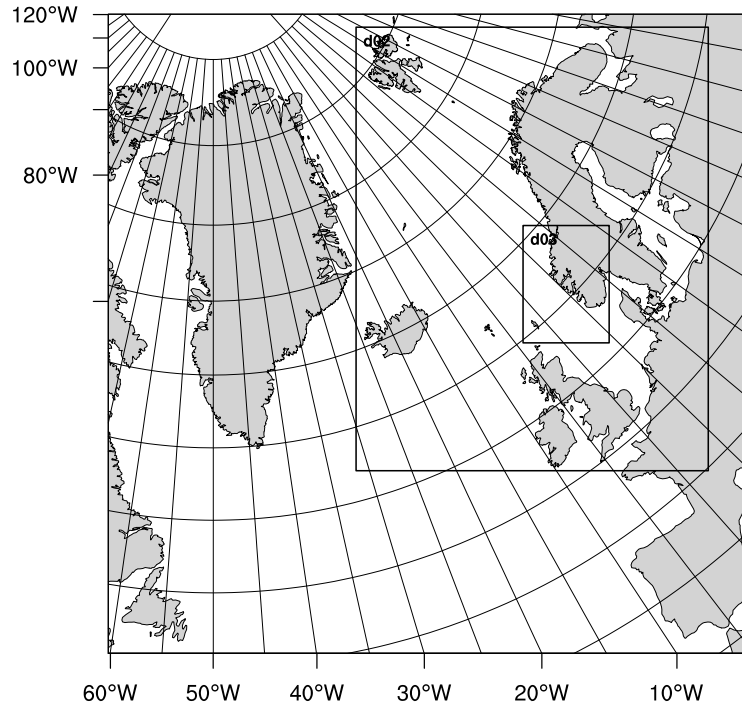

HORDAKLIM
- Currently running
- BC 2000 – 2030 (2100)

Onwards from here

- ## Investigate multiple years

HORDAKLIM
- Currently running
- BC 2000 – 2030 (2100)

- Almost running
- NBC 2000 – 2010

Onwards from here

- Investigate multiple years
- Do they show the same?

- Bias correct CMIP5 models
- Dynamically downscale ~ 3 of them
- Statistically downscale the remaining
- Weather generators (MET)
- Run hydrological models (NVE)

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Questions ?

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