Validation of atmospheric forcing for oceanographic models

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Models

- Lars Meuller, $1°$, analysis
- RCA 200612, ERA-40 down scaled 25 km
- RCA 200601, ERA-40 down scaled 50 km
- RCAO Baltrun 36, ERA-40 down scaled 50 km
- RCA 200713, ECHAM5 A1B_3 down scaled 50 km
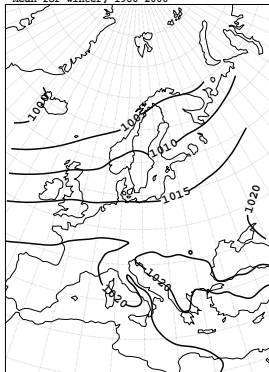- RCAO 200907, ECHAM5 A1B_3 down scaled 50 km

Time period: 1980 – 2006 (except RCA 200601 which ends three months early)
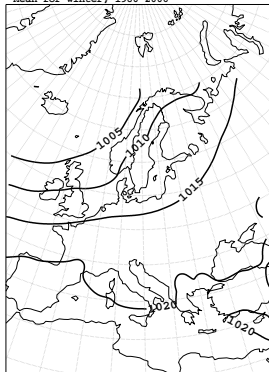
Sea level preassure

Lars Meuller, 1°
Mean for winter, 1980-2006
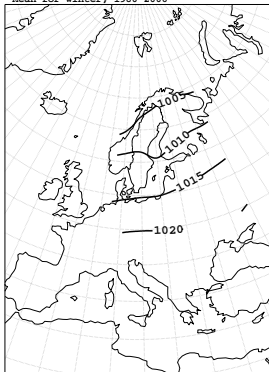
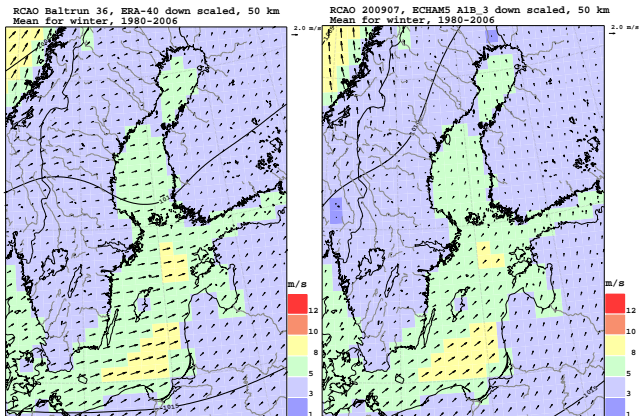RCAO Baltrun 36, ERA-40 down scaled, 50 km
Mean for winter, 1980-2006

RCAO 200907, ECHAM5 A1B_3 down scaled, 50 km
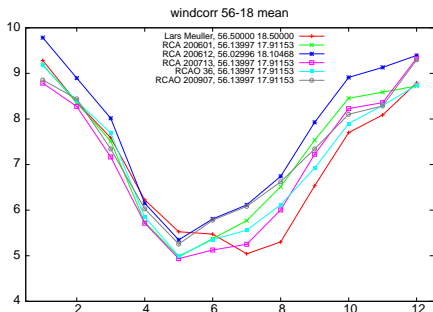Mean for winter, 1980-2006
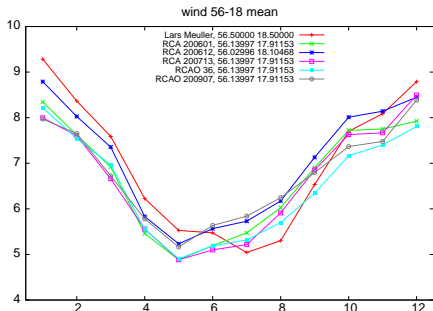
Wind direction

- Different pressure fields give different wind directions.
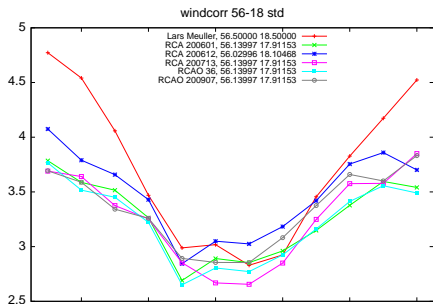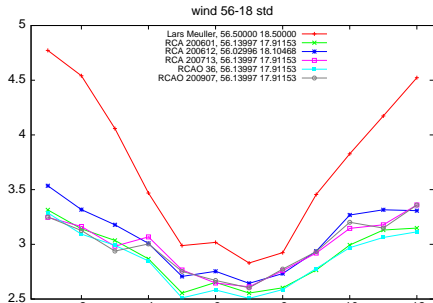
Wind, annual cycle, mean

- ▶ Higher resolution (dark blue vs green) resolves cyclones better, giving stronger winds.

Gust adjusted wind:
http://www.smhi.se/content/
1/c6/04/01/32/
attatchments/Oceanografi_97.pdf

Wind annual cycle, std

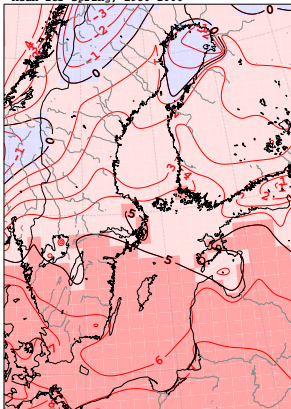- Adjusting the wind gives more strong winds (increasing variability).

Gust adjusted wind:
http://www.smhi.se/content/
1/c6/04/01/32/
attatchments/Oceanografi_97.pdf

Temperature, coupled vs uncoupled

- ▶ Uncoupled models use sea surface temperature (SST) from GCM.
- ▶ If GCM SST is biased, the 2 meter air temperature becomes biased.

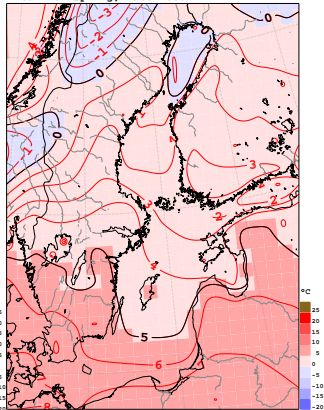# Temperature, coupled vs uncoupled

- Uncoupled models use sea surface temperature (SST) from GCM.

- If GCM SST is biased, the 2 meter air temperature becomes biased.

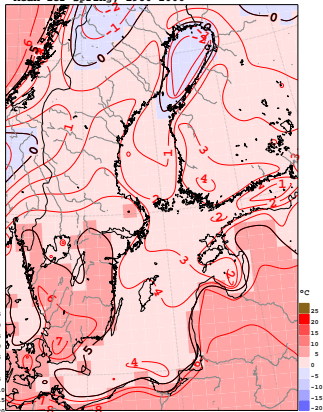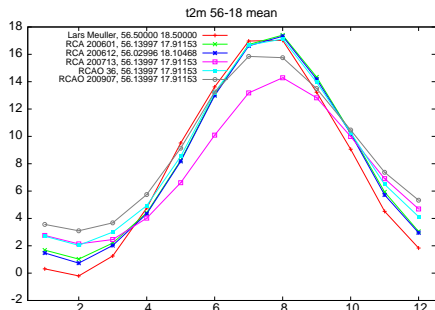# Temperature, analysis

Lars Meuller, 1°
Mean for spring, 1980-2006

- ▶ The analysis support the coupled models.
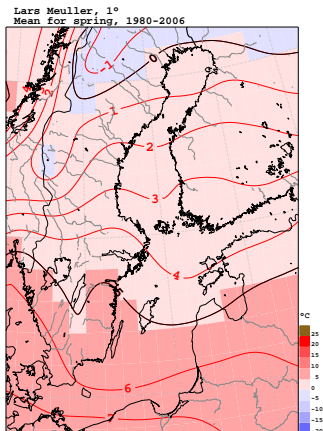
Temperature, annual cycle

- Lars Meuller (red): Winter bias $-2°$
- Uncoupled ERA-40 forced models (dark blue and green vs light blue); are too cold during winter.
- Uncoupled ECHAM5 forced models (purple vs gray) are too cold in spring and summer.

t2m 56-18 mean

Lars Meuller, 56.50000 18.50000
RCA 200601, 56.13997 17.91153
RCA 200612, 56.02996 18.10468
RCA 200713, 56.13997 17.91153
RCAO 36, 56.13997 17.91153
RCAO 200907, 56.13997 17.91153

Conclusions

- Coupled models are importent for temperature.
- Higher resolution important for wind.
- We can not have both!