

Climate and Energy Systems, 2007-2010

The Wind Energy group

<http://www.os.is/ces>

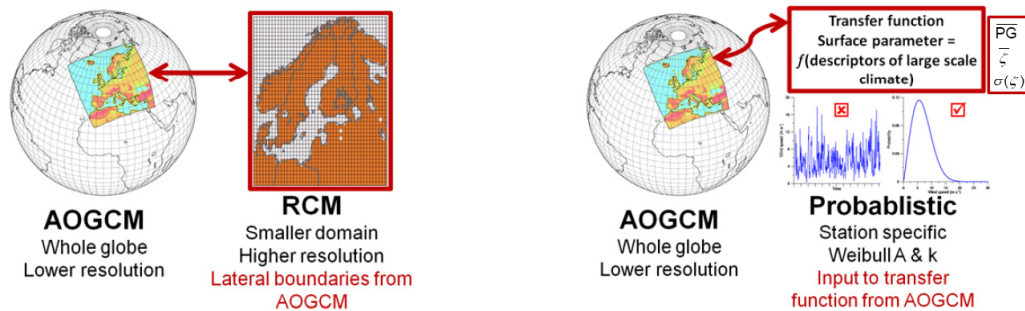
Focus of the Wind Energy group in CES

Focus in the CES project is on conditions for production of electricity from wind energy in the Nordic area and how they might change due to global warming during the next decades. This relates both to the production potential and especially design conditions for wind farms and their sensitivity to climate change. The principal aims of the wind energy group are to:

- Analyse extreme wind in the Nordic countries extreme wind atlas (50-year wind in 100 m height)
- Investigate climate change impact on the extreme and strong wind
- Development of a sea-state model to estimate fair-weather windows for offshore wind farms

Approach

The Global Climate Models (AOGCM) are downscaled to regional and/or local scale by either dynamical (to regional climate models –RCM and HIRHAM) or probabilistic downscaling



Activities and results

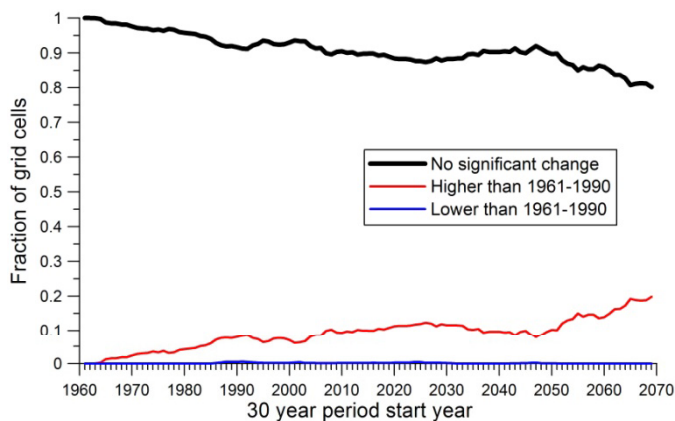
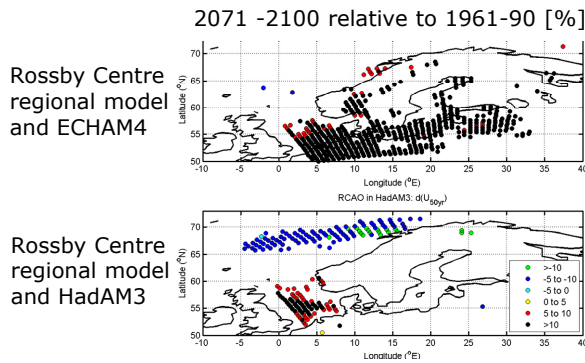


Fig. 1 For each grid cell (N Europe) the natural variability is estimated for the period 1961-90. The 50-year wind speed (U_{50}) is calculated for each moving 30-year period and it is determined whether U_{50} is outside the uncertainty bounds. The majority of the grid cells show no significant change, however a rising trend towards the end of the century is noted (red curve).

Activities and results



Changes in % for grid cells with significant changes

	Declines	No change	Increases
ECHAM4: A2	0.1	73.2	26.7
ECHAM4: B2	0.1	72.9	27.0
HadAM3: A2	6.0	90.1	3.9
HadAM3: B2	1.8	95.8	2.4

Fig. 2 The 50-year wind in 10m height. Two Global Circulation models and two emission scenarios are downscaled by the Rossby Centre regional model RCA and the change in 50-year wind speed (U_{50}) is calculated for the last 30 years of the 21st century compared to the period 1961-90. A significant dependency of the boundary conditions is seen while the two emission scenarios A2 and B2 are quite similar.

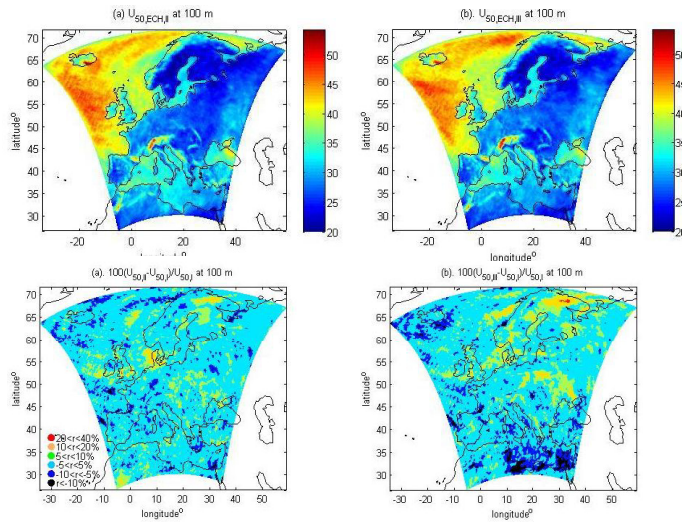


Fig. 3 The 50-year wind in 100 m height. Results from HIRHAM5 with ECHAM5 boundary conditions. Left graph for the middle of the century and right at the end of the century.

Fig. 4 Changes in U_{50} in %. Left graph for the middle of the century and right at the end of the century.

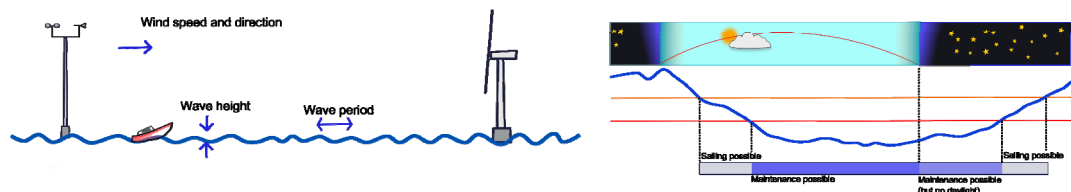


Fig. 5 Assessment of weather windows for access to offshore wind farms for construction work or maintenance.

Partners

The work in the Wind Energy group is carried out by a network of scientists from national research institutions and universities:

- Sara Pryor and Rebecca Barthelmie visiting scientists (Risø) on leave from Indiana University, USA
- Swedish Meteorological and Hydrological Institute (Sweden)
- Danish Meteorological Institute (Denmark)
- Finnish Meteorological Institute (Finland)
- University of Turku (Finland)

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