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Arctic Regional Coupled Downscaling of recent and possible future Climates

R. Döscher (1), T. Königk (1), K. Wyser (1), H.E.M. Meier (2), and P. Pemberton (3)

(1) SMHI, Rossby Centre, Norrköping, Sweden (ralf.doescher@smhi.se), (2) SMHI, Norrköping, Sweden, (3) SMHI, Norrköping, and Stockholm University, Sweden

SMHI/Rossby Centre has developed a regional coupled ocean-sea ice-atmosphere model of the Arctic (The Rossby Centre Atmosphere Ocean model RCAO). After validation of recent climate representation, first regional climate scenario experiments have been carried out based on two global scenario simulations (ECHAM5/MPI-OM and BCM) and the emission scenario A1B.

Within the EU-DAMOCLES project, validation of recent climate has been carried out under the conditions of the ECMWF reanalysis (ERA-40) and control periods of the global scenario simulations. Central validation parameters are the Arctic sea ice extent and its relation with large scale atmospheric circulation. Significant correlations between the winter North Atlantic Oscillation index and the summer Arctic sea ice thickness and summer sea ice extent are found in agreement with observations. A reduction of ice thickness is found to be related to large hemispheric scale atmospheric forcing. In an ensemble experiment, Arctic predictability has been assessed in order to quantify uncertainty due to non-linear interannual variability generated internally within the Arctic coupled system.

The regional scenario downscaling exercise has been set up as a set of scenario experiments covering the role of different processes and forcing on possible future climates. Initially, the regional scenarios have been run under different treatments of sea surface salinity and lateral boundary conditions. A first result indicates that occurrence of rapid change events in the Arctic are very much dependent on the hemisphere-scale atmospheric circulation.