Polar Coordinated Regional Downscaling Experiment (Polar CORDEX)

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Introduction

Polar CORDEX is part of the international CORDEX (Coordinated Regional Downscaling Experiment - Arctic and Antarctic Domains) initiative. Its primary goal is to organize an international coordinated framework to produce an improved generation of regional climate change projections for input into impact and adaptation studies. Currently, the core of Polar CORDEX consists of regional climate model (RCM) simulations over the Arctic, with both hindcast and scenario simulations being conducted. This effort is now expanding to include the Antarctic region as well. The Polar CORDEX community organized itself in 2013. The first meeting was held as a side event during the International Conference on Regional Climate (CORDEX 2013) in Brussels in November 2013. CliC helped building up and maintains the Polar CORDEX web page and mailing list.

Achievements for 2014

Focus was on atmosphere-only simulations over the Arctic CORDEX domain at ca. 50 km resolution forced by the ERA-Interim data. Simulations from 7 RCMs from different groups (model RCA4 from SMHI, Norrköping, Sweden; model CanRCM4 from CCCma, Victoria, Canada; model CCLM from Univ. of Trier, Germany, model HIRHAM5 from AWI, Potsdam, Germany; model WRF from Iowa State Univ., USA; model HIRHAM5 from DMI, Copenhagen, Denmark; model RRCM from MGO, St. Petersburg, Russia) have been finished. Other RCM simulations are running (model MAR from Univ. of Liège, Belgium; model WRF from Uni Research Climate Bergen, Norway; new WRF simulations from Iowa State Univ. and Univ. of Colorado, USA). First results of individual models are published. They discussed the effects of spectral nudging on the simulations (Berg et al., 2013; Glisan et al., 2014) and established the credibility of daily precipitation extremes over four North American regions (Glisan and Gutowski, 2013) in individual models. First results of a multi-model intercomparison with respect to temperature extremes quantified the considerable regional-scale across-model scatter (Matthes et al., 2014). First scenario simulations (CMIP5 GCM-driven RCP4.5, RCP8.5 simulations) have been conducted by 3 atmospheric RCMs and the other models will start their simulations in 2015. Also, the first Arctic CORDEX simulations with a coupled atmosphere-ice-ocean RCM (RCAO from SMHI) have been conducted, both driven by Era-Interim and GCMs. A few Antarctic CORDEX (hindcast, historical, scenario) simulations have been finished by 2 groups (model RACMO from KNMI, Netherlands; model WRF from New Mexico Inst., Socorro, USA).

The second Polar CORDEX meeting was held as a side event during the Regional-Scale Climate Modelling Workshop on 21st Century Challenges in Regional

Climate Modelling in Lund, Sweden in June 2014. The status of and future plans for simulations and analysis have been discussed. Further, a link to the Arctic Council "Adaptation Actions in a Changing Arctic" (AACA) project has been established. The AACA project looks at future climate impacts, their interactions with other non-climate and socio-economic drivers of change, and the relevance of this for designing adaptation policies. We discussed that available and relevant Arctic CORDEX results should feed into the AACA report.

Plans for 2015 and beyond

Arctic CORDEX

The Era-Interim driven runs will be finished in 2015. All groups will put their data on the ESGF archive such that the results are readily available for scientific analysis. Multi-model analysis will then be started. One focus of this analysis will be on extreme events and cyclones. Additional analysis may focus on other mesoscale processes (e.g. atmospheric boundary layer and marginal ice zone processes, clouds, etc.) which are one aspect of the simulations expected to demonstrate added value by the RCM simulations. It would also be interesting to investigate the atmospheric response to sea ice anomalies in the RCMs. Analysis relevant for the AACA report will be conducted. Some higher resolution (ca. 25 km) circum-Arctic atmospheric simulations and very high resolution (few km) runs for subdomains (e.g., Svalbard, Greenland) have been already done by individual groups; these will be included in these analyses.

The Polar CORDEX group also plans to downscale additional CMIP5 GCMs future projections for the Arctic CORDEX domain. In doing this we aim to arrive at a good RCM-GCM matrix, i.e. the groups will try to run their RCM with at least two different GCM forcings. Focus will be on RCM simulations for the RCP8.5 scenario. We expect to have simulations from ca. 6 RCMs.

Another goal is to set up coordinated coupled atmosphere-ice-ocean simulations. Different groups run or develop coupled Arctic RCMs (model RCAO from SMHI; model RASM from Univ. of Colorado, Boulder and Iowa State University; model COAWST from Uni Research Climate Norway; model HIRHAM-NAOSIM from AWI; model HIRHAM-HYCOM from DMI). Era-Interim- and GCM-driven runs are planned for the coupled model simulations.

Additional groups (model CRCM5 from UQAM, Montreal, Canada; model RACMO from Univ. Utrecht, KNMI, Netherlands) plan to participate with atmospheric RCM simulations.

Antarctic CORDEX

More Antarctic simulations are planned (model HIRHAM from DMI; model RACMO from Univ. Utrecht, KNMI; model COSMO-CLM from Univ. Leuven, Belgium).

References

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