Rossby Centre Newsletter

No 1 - 2006 **April 2006**

The Rossby Centre is the regional climate modelling research unit of the Swedish Meteorological and Hydrological Institute, SMHI. This Newsletter aims to provide useful information to stakeholders on climate change research and results of the Rossby Centre. This newsletter is published 2-4 times a year. The following topics are covered in this Newsletter:

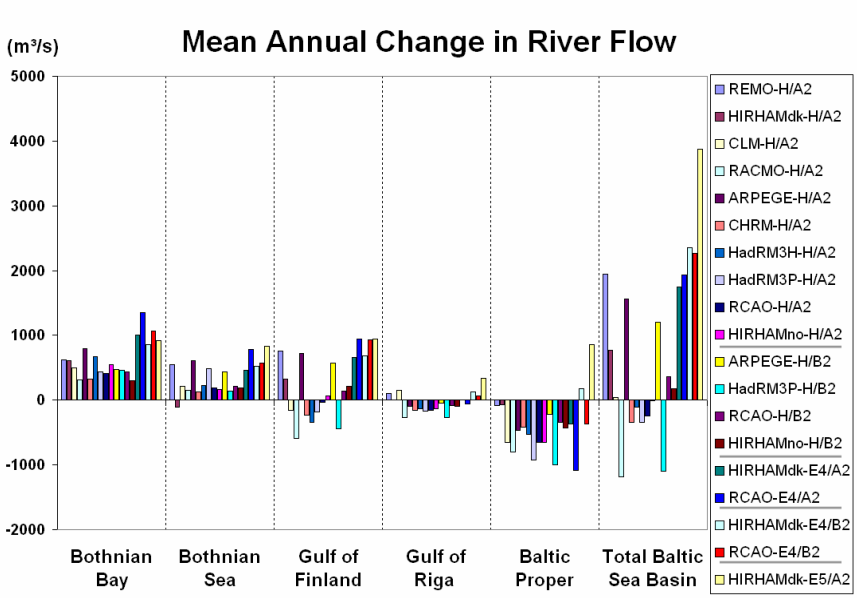
1. Climate, Water and Vulnerability – seminar

The Swedish Water House in cooperation with SMHI arranged a seminar and politicians' debate in Stockholm on the 30th of January. The seminar raised the question if we are doing enough to handle the risks with climate extremes and climate change. Researchers from Rossby Centre contributed with talks about climate change and hydrology in global, regional and local perspective. The Pungwe project (see also item 7) was presented as an example of Swedish international engagement in climate change issues.
http://www.swedishwaterhouse.se/seminars/showSeminarPrevious.asp?event_id=133

2. Projected climate change impacts on river flow to the Baltic Sea

The impact of climate change on river flow to the Baltic Sea has been studied with the HBV-Baltic hydrological model. This study is based on the regional climate scenarios made within the EU-funded PRUDENCE project that incorporated several regional climate models, different global climate models and two emission scenarios (SRES A2 and B2).

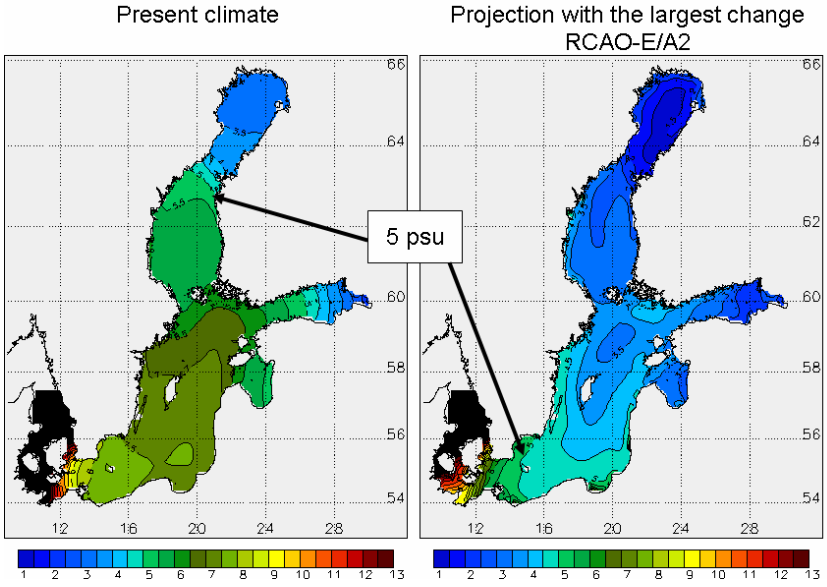
An increase in river flow is projected for the northernmost basins (Bothnian Bay), while a decrease is projected for the southernmost basins (Baltic Proper). Although there is considerable spread among results based on different models, the results are in general agreement for many areas regarding the sign of change. However, the results vary more for both the Gulf of Finland and the Gulf of Riga, the easternmost basins. The change in the total river flow to the Baltic also varies across these projections. The results show that both the choice of global climate model used for boundary conditions and the regional climate models themselves have an impact on simulation of how future climate and subsequent changes to hydrology develop in the region.



The figure contains results from 19 scenario simulations. Shown is mean annual change in river flow (m^3s^{-1}) for the five main Baltic Sea drainage basins and the total Baltic Sea Basin for the period 2071-2100 compared to the period 1961-1990. The global climate models used are specified as "H" for HadAM3H, "E4" for ECHAM4 and "E5" for ECHAM5. The order of the plotted bars is the same as in the legend. For comparison, the total observed mean annual river flow to the Baltic Sea Basin is 14210 m^3s^{-1} for the period 1961-1990.

3. Ensemble of scenario simulations for the Baltic Sea

A multi-model study of how climate change might affect the salinity of the Baltic Sea has also been recently completed. The study is made with the Rossby Centre regional ocean model RCO and uses also results from the large-scale hydrological model HBV-Baltic. Both of these models have been run on 16 climate scenario simulations available through PRUDENCE, encompassing seven regional models, five global models, and two emission scenarios. The study highlights how the uncertainty in projected regional precipitation and wind changes propagates to subsequent impact model studies. The projected salinity changes vary from statistically insignificant changes to rather large reductions.



Sea surface salinity (in psu): climatological data (left panel) and the ensemble member with the largest projected salinity change in 2071-2100 (RCAO-E/A2, right panel).

4. Assessment of Climate Change for the Baltic Sea Basin – the BACC Project – nearing completion

Coordinated by the BALTEX Secretariat (Baltic Sea Experiment) in cooperation with HELCOM, a comprehensive assessment of climate change for the Baltic Sea Basin has been conducted during 2005-2006. More than 80 co-authors from 12 countries have contributed, including a lead author and 3 co-authors from the Rossby Centre. The aim is to assess available knowledge of past, present and future climate in the Baltic Sea Basin. This includes related changes and impacts in marine, freshwater and terrestrial ecosystems. Results from the BACC Project will be presented to scientists, stakeholders and the interested public at a conference in Göteborg, 22-23 May 2006. The findings will be published in detail in a book to be released by Springer in late 2006. More detail on both BACC and the Göteborg conference can be found at www.gkss.de/BACC

5. Developing Arctic Modelling and Observing Capabilities for Long-term Environmental Studies (DAMOCLES)

A new EU-project DAMOCLES (Dec 2005 – Nov 2009) aims at reducing the uncertainties and deficiencies in our understanding of climate changes in the Arctic and their impacts.

Over the last 2-3 decades the Arctic has warmed more than other regions of the world, and the sea-ice cover has decreased significantly. DAMOCLES is especially concerned with the potential of reduced sea ice cover and the impacts this might have on the environment and human activities. The planned activities centre on an intensive observation campaign and modelling efforts, aiming at integrated monitoring and modelling capabilities.

The Rossby Centre participates in the project management and provides scientific contributions. The latter concern further evaluation of the coupled regional climate model RCAO and its standalone components RCO and RCA for the Arctic region, following up the efforts that were initiated in the earlier EU-funded GLIMPSE project. Sensitivity tests will be carried out to explore processes relevant to sea ice variability and the current sea ice extent decrease. Predictability experiments will help distinguishing internal Arctic variability from forced climate change. Climate scenario studies for the Arctic region are also planned towards the end of the project.

DAMOCLES is one of the largest ever financed EU projects in geo-sciences. It represents a major contribution of the EU to the upcoming International Polar Year (IPY) 2007/2008.

6. Evaluating clouds in climate and forecast models

Clouds and the interaction with radiation and aerosols are very import for the climate. Clouds are very difficult to model due to their high variability in time and space and there are many cloud processes that are not fully understood. Satellite and ground based synoptic data are used to evaluate model results on cloud cover and cloud optical thickness.

Recently ground-based active instruments, such as cloud radars, lidars and microwave radiometers that measure vertical profiles of cloud fraction, cloud water and ice have been used at three sites in Europe, Cabauw in the Netherlands, Palaiseau in France and Chilbolton in the UK.

The Rossby Centre climate model, RCA, and other regional and global models have been evaluated at these sites within the CloudNET project (http://www.cloud-net.org/). The first results have led to further development of the precipitation parameterisation of RCA and improved radiation fluxes at the surface. Efforts are being made for finding financial support for operating the European cloud remote sensing stations as a continuous network.

7. Southern Africa's sensitivity to climate change

The climate simulations over Southern Africa mentioned in the RC Newsletter No 3-05 are now being finalized. Some results have already been presented to the stakeholders around the Pungwe river basin in Mozambique and Zimbabwe as well as the funding agency UNDP.

The Rossby Centre regional climate model RCA has been used to downscale global climate simulations made with the ECHAM4/OPYC3-model and two emission scenarios, SRES A2 and B2. The overall results for southern Africa are similar in the two scenarios. However, the results show a large discrepancy and sensitivity for climate changes in the Pungwe area. In one of the scenarios, there is a small decrease in precipitation of about 10 percent and a warming of about 2 degrees, leading to a dramatic change in water availability. In the other scenario a slight precipitation increase of 10 -20 percent is enough to satisfy increased evapotranspiration caused by a temperature increase of 1.5 degrees. The soil moisture conditions are, in the second scenario, rather unchanged compared to the present day conditions.

8. A new report on wind, sea level and river discharge

A report on "Climate change scenario simulations of wind, sea level, and river discharge in the Baltic Sea and Lake Mälaren region – a dynamical downscaling approach from global to local scales" has been published within the SMHI Reports Meteorology Climatology series (No 109, 2006). The work is a part of the EU INTERREG IIIb project Seareg, Sea Level Change Affecting the Spatial Development in the Baltic Sea Region.

The report can be ordered from kundtjanst@smhi.se . A version of the report can be printed from www.smhi.se/sgn0106/if/biblioteket/rapporter_pdf/RMK109.pdf

9. Basics of the Rossby Centre

The Rossby Centre works on regional climate model development and evaluation as well as model applications on process studies, climate system studies, climate change research and impact studies. The Rossby Centre is also involved in a number of EU-funded and other projects on climate modelling and other aspects of climate and climate change research.

Rossby Centre homepages are mainly in English and are found via www.smhi.se (Click on "Forskning"/"Research" at the top of the page and thereafter at the Rossby Centre link in the left panel.)

10. Subscription and cancellation of subscription

The Rossby Centre newsletter is sent as an email blind copy to those who wish to receive a text version. The full version is reached via the Rossby Centre homepages (see item 9) under "Newsletter".

Comments and suggestions as to the scope, content and forms of the newsletter are welcome. Feedback can be provided via rossby.data@smhi.se .

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