Assessment of Climate Change for the Baltic Sea Basin - The BACC Project - 22-23 May 2006, Göteborg, Sweden

Projections of Future Climate Change

3) Projections from Regional Climate Models

Winter Temperature Projections

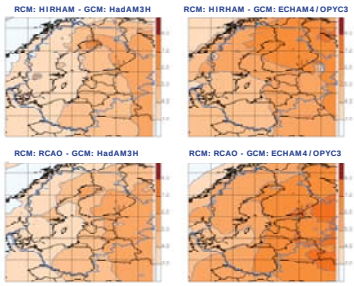

Fig. 1: RCM simulated temperature change in ºC for winter (DJF) between the periods 1961-1990 and 2071-2100 using the SRES-A2 emissions scenario. Shown are results using a ~50 km grid resolution from the HIRHAM Model (top) and the RCAO Model (bottom). GCM boundary conditions are from HadAM3H (left) and ECHAM4/OPYC3 (right).

Summer Temperature Projections

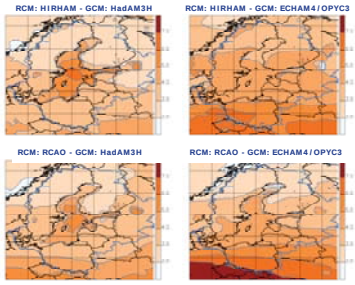

Fig. 2: RCM simulated temperature change in ºC for summer (JJA) between the periods 1961-1990 and 2071-2100 using the SRES-A2 emissions scenario. Plot details as in Fig. 1.

Extreme Temperature Projections

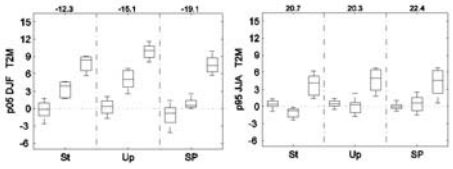

Fig. 3: Daily mean temperature deviation (ºC) from 1961-1990 observed median for the 5th percentile for winter (left), and the 95th percentile for summer (right). Three boxplots are shown for each of 3 stations—Stockholm (St), Uppsala (Up) and Saint Petersburg (SP); left is the observed spread between overlapping 30-year periods from the last 200 years, middle is the RCM spread for the control period, and right is the RCM spread for SRES-A2 simulations. Each box extends from the lower to the upper quartile; the line inside the box denotes the median. The vertical lines extend from the lower (upper) quartile to the minimum (maximum) value. Values of the 1961-1990 observed median are shown along the top.

Snow Projections

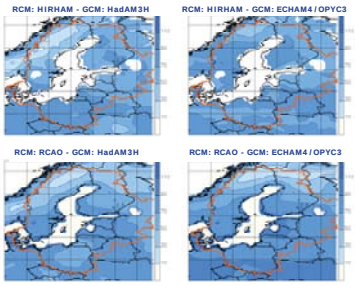

Fig. 4: RCM simulated snow depth reduction in percent for winter (DJF) between the periods 1961-1990 and 2071-2100 using the SRES A2 emissions scenario. Plot details as in Fig. 1.

To achieve more geographically detailed assessments of future climate change, downscaling methods are used. Selected results are shown here from four downscaling simulations using two different regional climate models (RCMs) (upper and lower panels), with two different GCMs to provide boundary conditions to the RCMs (left and right panels), applying the SRES-A2 emission scenario. Although these results give an indication of plausible future anthropogenic climate changes, they do not fully reflect the range of uncertainties in the GCM projections.

Summary conclusions for some 20 RCM simulations based on both SRES-A2 and B2 scenarios are made below. All values refer to changes projected for the late 21st century, represented here as differences in climate between the years 1961-1990 and 2071-2100.

Temperatures are projected to increase

- A projected warming of the mean annual temperature by some 3 to 5 ºC for the total basin (consistent with GCMs).
- Seasonally, the largest warming would occur in winter for northern areas of the Baltic Sea basin and in summer for southern areas.
- The diurnal temperature range (difference between daily maximum and minimum) would also decrease, most strongly in autumn and winter.
- Projected changes in extreme temperature are larger than those for the mean and well outside observed variability for the past 200 years.

Precipitation is projected to increase, with large spatial and seasonal variation

- A projected increase in annual basinwide precipitation, but with considerable subregional and seasonal variation.
- Northern areas could expect winter precipitation increases of some 25 to 75%; summer changes would be -5 and 35%.
- Southern areas could expect similar winter increases of 20 to 70%; summer changes would be negative, decreasing as much 45%.
- Broadly consistent with GCM studies, although the summer decrease in southern areas tends to be larger and extend further north in the available RCM studies.

Wind speed projections are not robust

- Projected changes in wind differ widely between climate models and there is no robust signal in the RCM results.
- This is largely a function of the large-scale circulation from the driving GCMs.

Winter Precipitation Projections

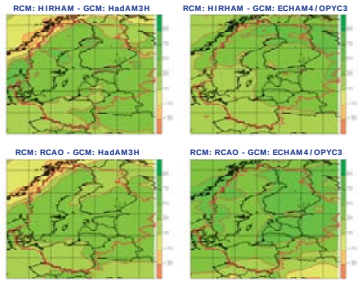

Fig. 5: RCM simulated precipitation change in percent for winter (DJF) between the periods 1961-1990 and 2071-2100 using the SRES-A2 emissions scenario. Plot details as in Fig.1.

Summer Precipitation Projections

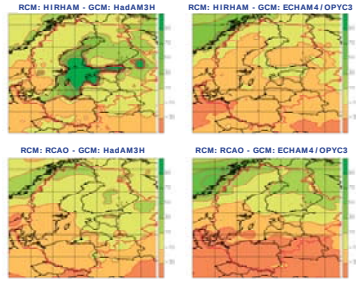

Fig. 6: RCM simulated precipitation change in percent for summer (JJA) between the periods 1961-1990 and 2071-2100 using the SRES-A2 emissions scenario. Plot details as in Fig. 1.

Winter Wind Projections

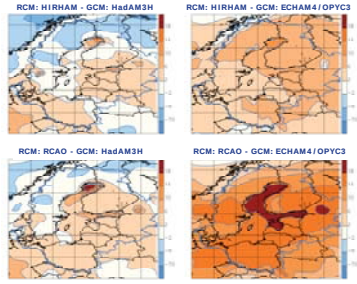

Fig. 7: RCM simulated wind speed change in percent for winter (DJF) between the periods 1961-1990 and 2071-2100 using the SRES-A2 emissions scenario. Plot details as in Fig. 1.

Summer Wind Projections

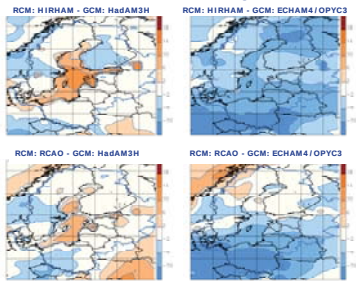

Fig. 8: RCM simulated wind speed change in percent for summer (JJA) between the periods 1961-1990 and 2071-2100 using the SRES-A2 emissions scenario. Plot details as in Fig. 1.

Organised by: Göteborg University, GKSS, HELCOM
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