Comparison of two different regional climate model ensembles to plan adaptation to the changing climate

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Introduction

High resolution climate information from a multi model ensemble is required for the development and the planning of measures to adapt to changing climate (e.g. German Adaptation Strategy). Using a multi model ensemble is essential to achieve information on possible ranges of future climate change for climate impact research and as background information for policy and economy. The BMBF project ReKliEs-De will provide consistent and user-tailored information for federal agencies and climate impact and adaptation research. To achieve this, a national coordinated effort is proposed to examine the EURO-CORDEX simulations on 12 km horizontal resolution for Germany and to systematically complement them by further simulations with both dynamical and statistical downscaling methods. One task is to compare previous results with the new results, since the policy and administrative users will need to assess whether previous decisions on adaption based on the climate change projections following the SRES scenarios are still valid under the range of the new scenarios.

Model data and region:

ENSEMBLES
SRES A1B
horizontal resolution: 0.22 °
15 Simulations:
Combination of
4 GCMs (cmip3) und 8 RCMs

EURO CORDEX
RCP4.5 und RCP8.5
horizontal resolution 0.11 °
13 Simulations:
Combination of
5 GCMs (cmip5) und 6 RCMs

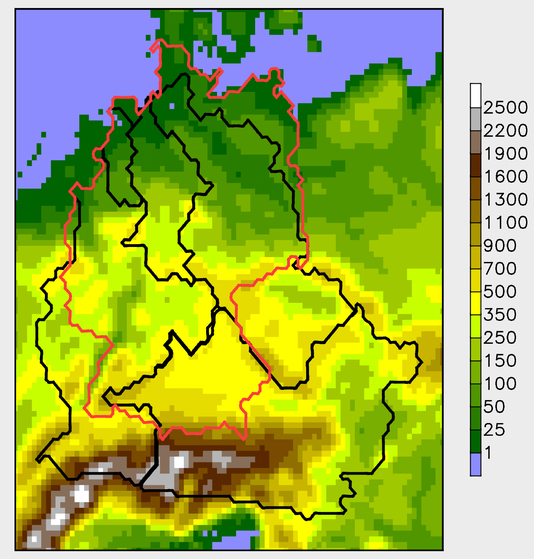

Figure 1: Orography Germany (red) drainage basins: Danube, Rhine, Elbe, Weser, Ems (black).

Climate Indices for the area of Germany

30-year „running mean“ 1986 - 2085 minus (1971 - 2000)

Number of Frost Days Tmin < 0°C | Number of Summer Days Tmax>25°C | Number of Tropical Nights Tmin > 20°C

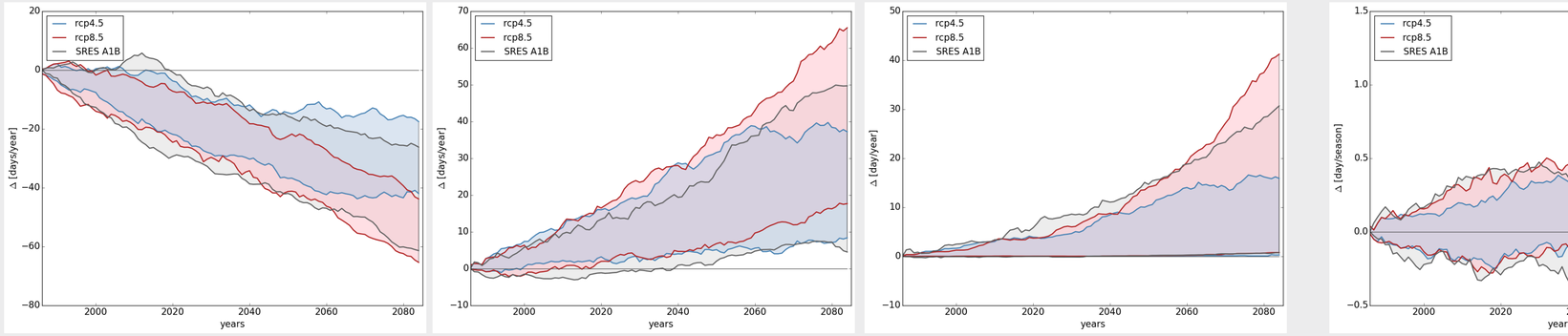

Figure 2 shows from left to right the bandwidth between minimum and maximum change of the number of frost days, summer days and tropical nights calculated for the CORDEX RCP4.5, RCP8.5 and ENSEMBLES A1B simulations.

Number of very heavy Precipitation Days mm/day > 20 mm
June - August | December - February

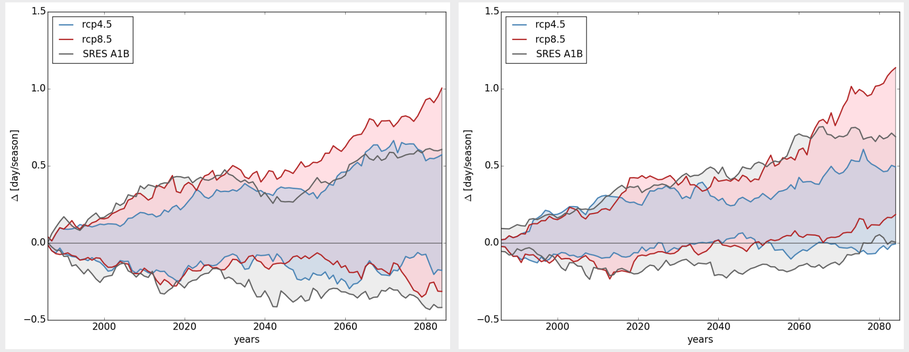

Figure 3 shows the bandwidth of change of very heavy precipitation days calculated for the CORDEX RCP4.5, RCP8.5 and ENSEMBLES A1B simulations.

Ensemble Minimum, Mean and Maximum Change of seasonal Precipitation [%]

JJA Ensembles SRES A1B DJF | JJA CORDEX rcp4.5 DJF | JJA CORDEX rcp8.5 DJF

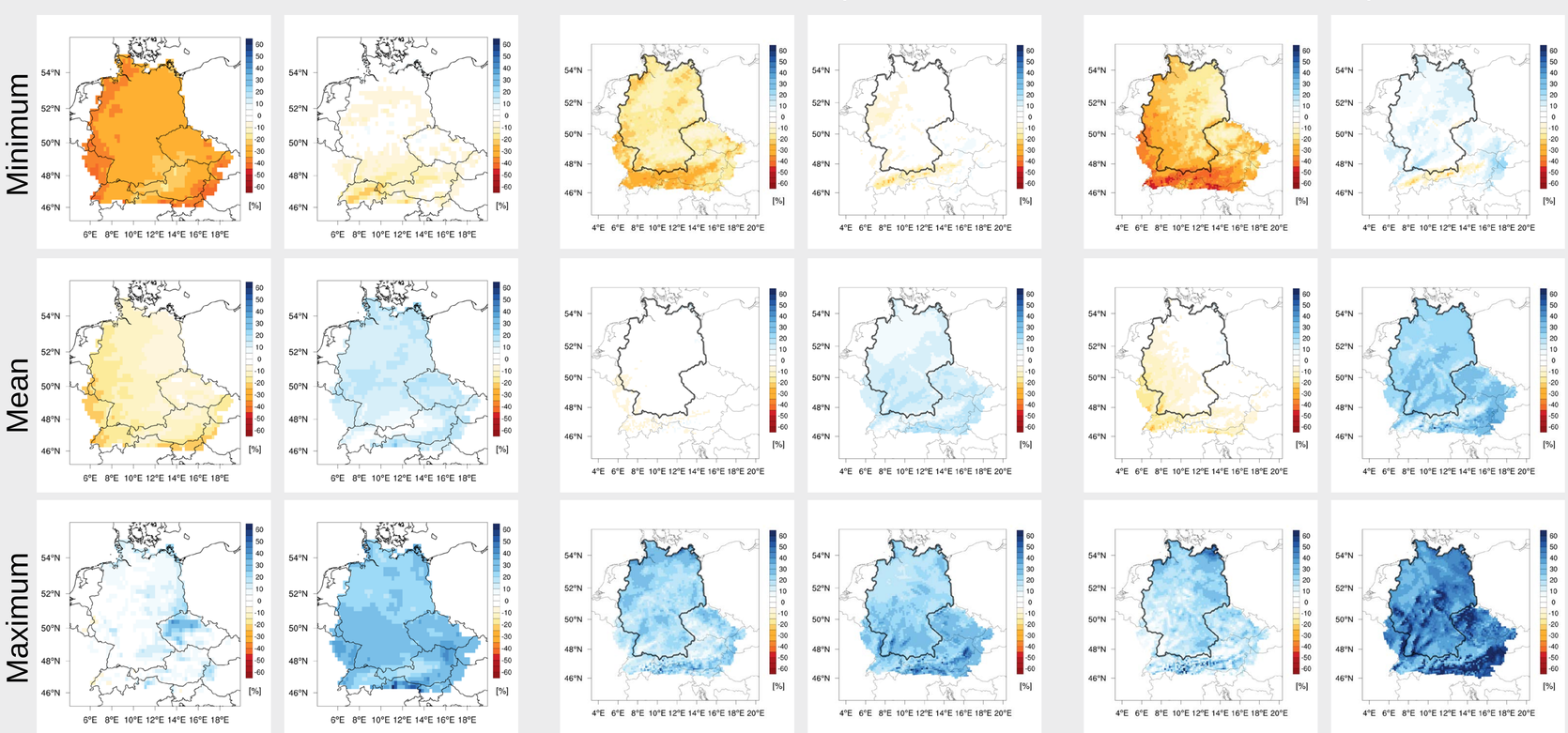

Figure 4 shows from top to bottom the ensemble minimum, mean and maximum of seasonal precipitation change [%] (2071-2100) – (1971-2000) and from left to right for ENSEMBLES SRES A1B, CORDEX RCP4.5 and CORDEX RCP8.5 simulations.

Climate change in 2071-2100 compared to 1971-2000

- **Number of frost days decrease**
- **Number of tropical nights and summer days show a large bandwidth in change**
- **Number of very heavy precipitation days shows a decrease and increase in summer, in winter only an increase**
- **Seasonal precipitation change:**
  June-August: A1B: -30% to -5%
  RCP4.5 and 8.5: -25% to 25%
  Dec.-Feb.: RCP8.5: 0% to 50%
  A1B and RCP4.5: -5% to 30%

These results depend on the selection of the ensemble. The maximum change of all results from the RCP8.5 simulation exceeds the maximum change of the SRES A1B simulations.

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