The Project ReKliEs-De: Complementing EURO-CORDEX with high-resolution dynamical and statistical simulations

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ReKliEs-De
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Simulation domain:

EURO-CORDEX-domain (orange) for dynamical models; Germany and river catchments draining into Germany (blue) for statistical models

Bias adjustment:

2 methods for rainfall: Local Intensity Scaling (LOCI) and Analytical Quantile Mapping (AQM). Rainfall data are available as uncorrected, or corrected with one of the two methods.

Threshold-based indices (e.g. heat-days, summer-days, rainfall above 10 or 20 mm) are corrected so that the simulated occurrence frequency of the reference period matches the observed frequency. The resulting threshold value in the model is also used for the scenario periods.

Highlight:

24 Indices for temperature, precipitation, wind and radiation are post-processed and available for download (data files and graphics). Indices include averages (annual, seasonal), threshold exceedances, extreme percentiles (95. + 99. perc.) and duration indices (warm / cold spell, wet / dry periods).

Number of dry spells of different lengths for JJA 1971-2000, ReKliEs-area (brown) and change signals for RCP8.5, 2021-2050 (green) and 2071-2100 (red) w.r.t.1971-2000.
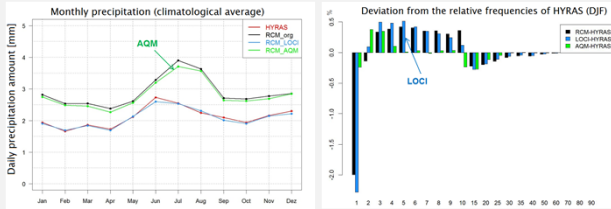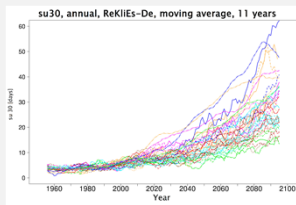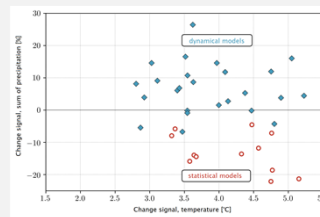
Background:
German federal environmental agencies requested support for analyzing and communicating RCP2.6 and RCP8.5 results. The project was coordinated by an environmental agency and supervised by members of further German federal environmental agencies.

Matrix of analyzed simulations:

GCM + RCP	CCLM	REMO	WRF	WR13	STARS3	RCA4	RACMO	HIRHAM5
EC-EARTH RCP2.6	EURO-CORDEX				ReKliEs-De	EURO-CORDEX	EURO-CORDEX	EURO-CORDEX
HadGEM2-ES RCP2.6					ReKliEs-De	EURO-CORDEX	EURO-CORDEX	
MPI-ESM-LR RCP2.6	ReKliEs-De	EURO-CORDEX	ReKliEs-De	ReKliEs-De	ReKliEs-De	EURO-CORDEX		
MPI-ESM-LR RCP8.5	EURO-CORDEX	EURO-CORDEX	EURO-CORDEX	ReKliEs-De	ReKliEs-De	EURO-CORDEX		
CNRM-CM5 RCP8.5	EURO-CORDEX	ReKliEs-De		ReKliEs-De	ReKliEs-De	EURO-CORDEX		
HadGEM2-ES RCP8.5	EURO-CORDEX	ReKliEs-De	ReKliEs-De	ReKliEs-De	ReKliEs-De	EURO-CORDEX	EURO-CORDEX	
EC-EARTH RCP8.5	EURO-CORDEX	ReKliEs-De	ReKliEs-De	ReKliEs-De	ReKliEs-De	EURO-CORDEX	EURO-CORDEX	EURO-CORDEX
Can-ESM2 RCP8.5	ReKliEs-De	ReKliEs-De		ReKliEs-De	ReKliEs-De			
MIROC5 RCP8.5	ReKliEs-De	ReKliEs-De	ReKliEs-De	ReKliEs-De	ReKliEs-De			
IPSL-CM5A RCP8.5			EURO-CORDEX			EURO-CORDEX		

The EURO-CORDEX simulation matrix was significantly filled up with simulations. WR13 and STARS3 are statistical downscaling methods, all others are dynamical models. All simulations use 0.11° resolution.

Selected results:

Comparing RCP8.5 with RCP2.6 results for Germany, 2071-2100 w.r.t. 1971-2000 for all analyzed indices shows: Roughly ¾ of climate change simulated for RCP8.5 could be avoided when following RCP2.6.

Change in annual mean temperature for RCP2.6 and RCP8.5 (only model combinations that were available for both scenarios)

Change in temperature (x-axis) and precipitation (y-axis) for dynamical (blue) and statistical (red) models, 2071-2100 compared to 1971-2000, RCP8.5.
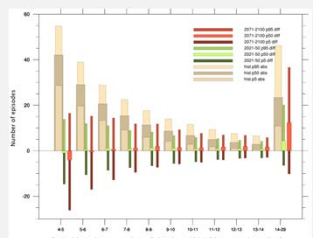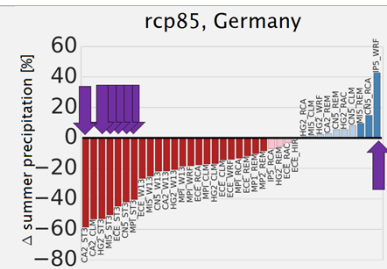
Systematic differences are found for precipitation projections between statistical and dynamical downscaling results.

Temperature results were mainly dominated by driving GCM.

Problem:

Plausibility of some simulations?

Example: IPSL-WRF shows summer rainfall increase of >40%,

STARS simulations show decrease of 40 – 60%.

Projected change in summer (JJA) rainfall for Germany, RCP8.5, 2071-2100 w.r.t.1971-2000.

Further information, data and results of ReKliEs-De are available via: http://reklies.hlnug.de