Project: **945**
Project title: **SASSCAL**
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The Climate Service Center Germany led workpackage 2, task 006 “Expanding the database for a robust regional climate change assessment and uncertainty analysis” of the African Science Service Centre for Climate Change and Adaptive Land Management (SASSCAL) funded by the BMBF. A profound and robust data base of quality controlled high-resolution climate projections is necessary to estimate the potential impacts of future climate change on the water resources, agriculture, forestry and human livelihoods in the SASSCAL region. Within the task, therefore already existing high-resolution climate change projections were identified and analysed as an initial activity. But also the design and realization of new high-resolution climate change projections over the region were implemented in the process since the rapid development in computational capacity also allows more processes affecting the climate system to be included in the projections. The resulting ensemble of high-resolution climate projections can serve as basis for assessments to quantify the degree of robust climate change in contrast to climate variability and inherit model uncertainty in ongoing and upcoming investigations.

The focus of this task was on the expansion of the data base of quality controlled high-resolution climate change projections over the SASSCAL region. Furthermore, large emphasis was given to the ongoing knowledge transfer and capacity building to facilitate the research institutions of the SASSCAL region in analysing existing observations and climate change projections, running regional modelling systems and assessing the possible future scenarios and associated uncertainties.

Initially, annual mean changes of temperature and precipitation over southern Africa from all available CMIP5 global climate projections were analysed. To cover the full range of possible temperature and precipitation changes, five additional regional climate change projections were identified to fill the gaps. These five additional transient regional climate change projections using REMO forced with GFDL-ESM2G (RCP2.6), MIROC5 (RCP2.6), HADGEM2-ES (RCP2.6), IPSL-CM5A-LR (RCP2.6 and RCP8.5) were conducted at a spatial resolution of 50 x 50 km² and analysed over the CORDEX-Africa domain. Subsequently, all five regional climate change projections were uploaded to the Earth System Grid Federation System (ESGF). An analysis of these five climate change projections showed that the models projected an increase in mean temperature of 0 to 3 °C for the low emission scenario (RCP2.6) and of 4 to 8 °C for the high emission scenario (RCP8.5) until the end of the century over the CORDEX-Africa domain (Fig. 1a-e). The strongest warmings were projected for northern and southern Africa. For the mean daily precipitation (DJF) the models simulated changes between -0.5 and 0.5 mm/day over northern Africa and between -2 and 2 mm/day over southern Africa for the low emission scenario (RCP2.6) (Fig. 2a-e). The bandwidth of mean daily precipitation change extended to -3 to 5 mm/day for the high emission scenario (RCP8.5) over southern Africa until the end of the century.

Publication

Weber, T., Haensler, A., Rechid, D., Eggert, B. & D. Jacob (2017): Analysing regional climate change in Africa in a 1.5 °C, 2 °C and 3 °C global warming world. Earth’s Future. Submitted

Figures

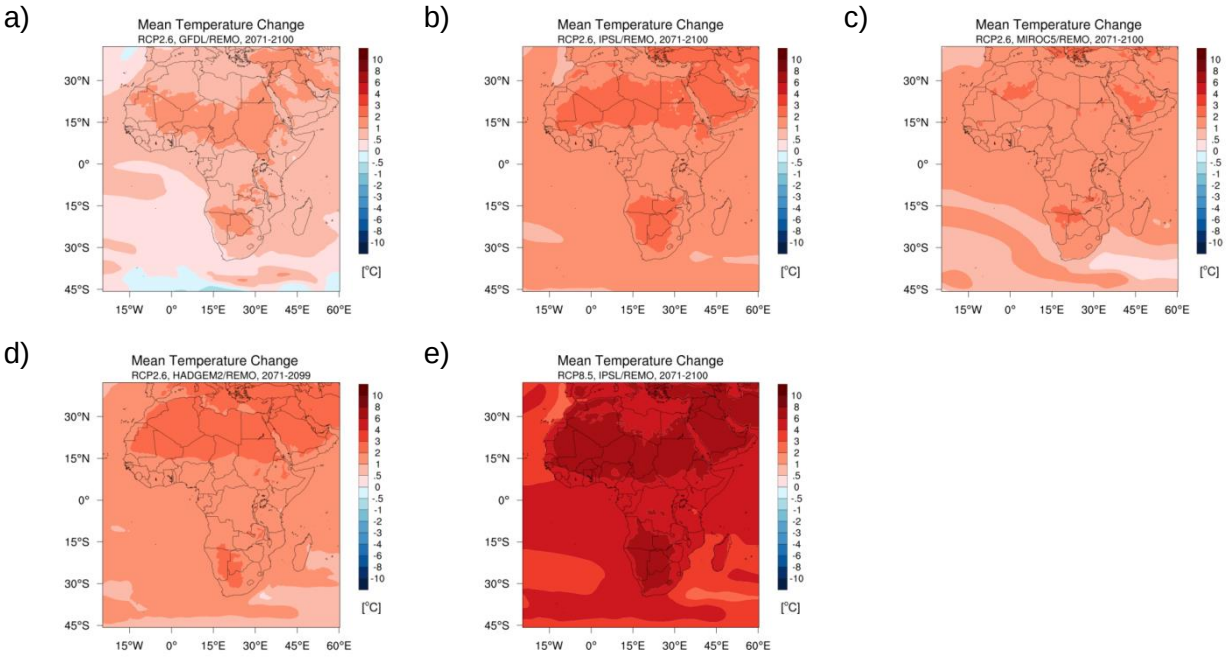

Fig. 1: Projected mean temperature change by REMO for the end of the century respective to 1971-2000 using different global forcing data and emission scenarios. a) GFDL-ESM2G RCP2.6, b) IPSL-CM5A-LR RCP2.6, c) MIROC5 RCP2.6, d) HADGEM2-ES RCP2.6 and e) IPSL-CM5A-LR RCP8.5.

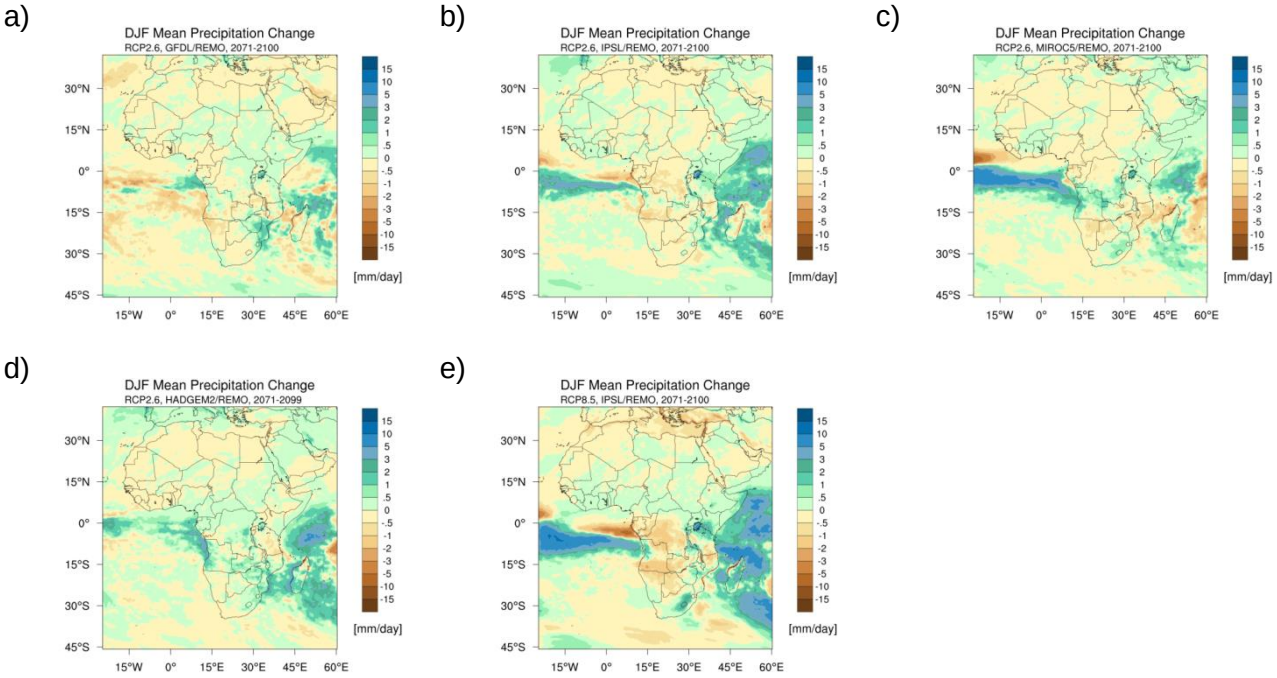

Fig. 2: Projected mean daily precipitation change for Dec.-Feb. by REMO for the end of the century respective to 1971-2000 using different global forcing data and emission scenarios. a) GFDL-ESM2G RCP2.6, b) IPSL-CM5A-LR RCP2.6, c) MIROC5 RCP2.6, d) HADGEM2-ES RCP2.6 and e) IPSL-CM5A-LR RCP8.5.