Ongoing Research and Interim Results (until 15.11.2011)

As an essential first step of a regional climate change analysis, the applied regional climate models (RCMs) have to be validated with observational data. For this purpose, so-called hindcast simulations are conducted, in which the past climate is simulated with a regional model using reanalysis data as forcing. From these simulations, meteorological variables such as temperature or precipitation are compared to observational data to evaluate the model performance.

Subsequently, regional climate scenarios are generated with RCMs driven by global climate scenarios. To obtain the climate change information, each control run simulating the past climate is compared to its respective scenario run simulating the future climate. As this is carried out with different RCMs forced by global climate scenarios, the uncertainty of the climate change information can be estimated.

Until now, the following interim results have been achieved:

The high-resolution hindcast simulation with the regional climate model REMO forced with ERA-Interim Reanalysis data for the period 1989-2008 was created and the validation of this run has begun. An extension of the simulation period from 1980 to 1988 and 2009 to 2010 is foreseen to carry out due to the demand of the subproject partners and the new availability of the ERA-Interim Reanalysis data for this time. Moreover, the preparation of the hindcast simulation with REMO using ERA-40 Reanalysis data for the period 1960-2000 is ongoing and will be accomplished by the end of 2011. The setups for the hindcast simulations (and later also for the climate scenarios simulations) are prepared according to the specifications of the Coordinated Regional climate Downscaling Experiment (CORDEX).

The hindcast simulation with REMO/ERA-Interim has been carried out with a high spatial (of 25 x 25 km²) and temporal resolution and provides more detailed climatological information for the Okavango region compared to the application of general circulation models (GCMs) (e.g. Haensler et al., 2011). Preliminary results of the validation run shows that REMO/ERA-Interim reproduces the mean precipitation (Figure 1) as well the annual precipitation cycle (Figure 2) compared to observational data from the Climate Research Unit (CRU) (Mitchell and Jones, 2005) very well.

Figure 1: Mean deviation of precipitation simulated by REMO/ERA-Interim compared to CRU for the period 1989-2008.

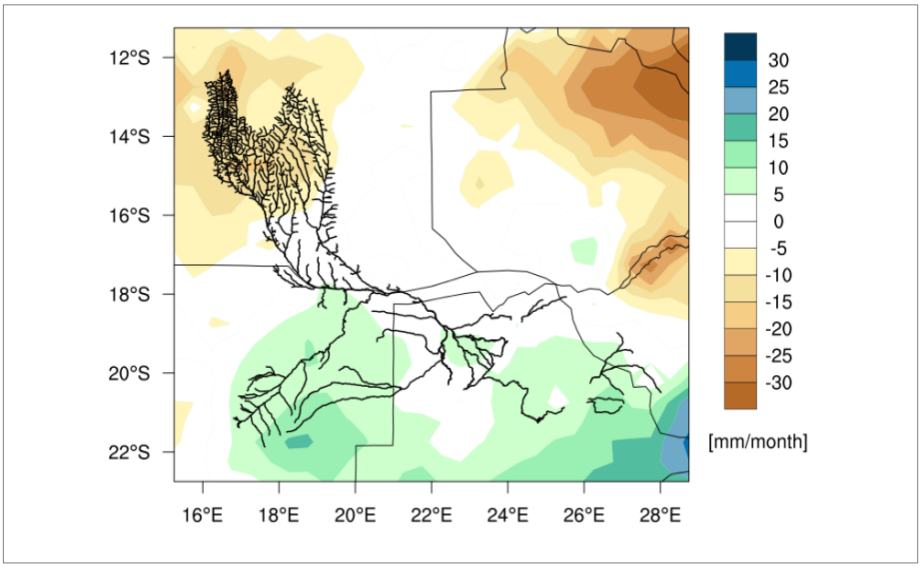
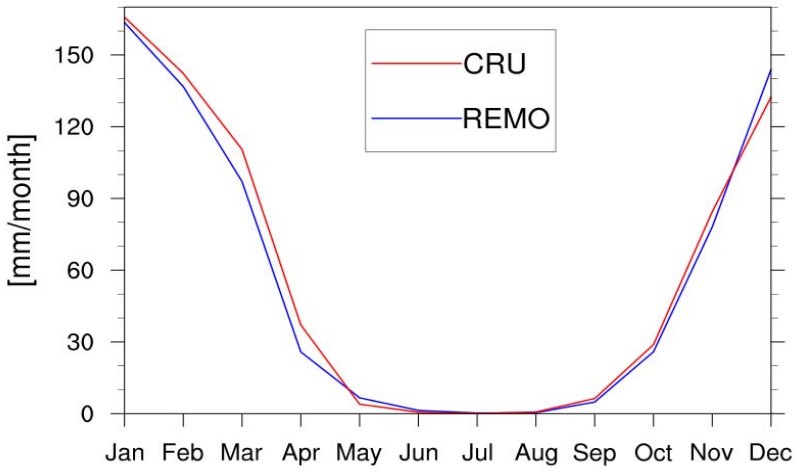


Figure 2: Mean annual precipitation cycle simulated by REMO/ERA-Interim compared to CRU for the period 1989-2008.



The next steps will be to extend the hindcast simulation of REMO/ERA-Interim from 1980 to 1988 and 2009 to 2010 and to start the generation of the regional climate change scenarios using the global scenarios from the Coupled Model Intercomparison Project (CMIP5) as forcing. Furthermore, the analysis of the REMO/ERA-Interim simulation will be continued and the analysis of the REMO/ERA40 simulation will be started when its creation is finished.

References:

Haensler, A., Hagemann, S., Jacob, D. (2011) The role of the simulation setup in a long-term high-resolution climate change projection for the southern African region. Theoretical and Applied Climatology, 106, 153-169. Doi: 10.1007/s00704-011-0420-1

Mitchell, T. D., Jones, P. D. (2005) An improved method of constructing a database of monthly climate observations and associated high-resolution grids. International Journal of Climatology, 25, 693-712. Doi 10.1002/joc.1181