



## **Impact of future climate change on the Orange River runoff**

Andreas Haensler and Stefan Hagemann

Max-Planck-Institute for Meteorology, Land in the Earth System, Hamburg, Germany (andreas.haensler@zmaw.de)

The 973.000 km<sup>2</sup> large Orange River catchment is the main drainage system of the southern African region, originating in the Drakensberg Mountains and reaching the Atlantic Ocean at the border between Namibia and South Africa. Due to its size, it is of major economic importance for the region, as its water is used for drinking water purposes, irrigation and the generation of electricity. Changes of the hydrological conditions in the Orange River catchment therefore will have a major impact on the region. For the future, the 4th Assessment Report of the IPCC (AR4) projected a severe decrease of rainfall for the southern African region. In combination with rising temperatures and changed evaporation rates, this is likely to have a substantial influence on the Orange River flow.

One of the deficits of the general circulation models (GCMs) used in AR4 to predict future climate change is their coarse resolution, which often leads to an unrealistic simulation of rainfall patterns, especially over mountainous regions. Using the output of GCMs as input for hydrological discharge models therefore might result in unrealistic flow regimes. Applying a high-resolution regional climate model to downscale global GCM output over the region of interest has the ability to improve the simulation of rainfall substantially.

In our study, we present projected long-term changes (up to 2100) of the Orange River runoff, thereby focusing on changes in the occurrence of extreme conditions like floods and droughts. As input for the analysis, climate data from a high-resolution long-term transient regional climate model projection at a horizontal resolution of 18km as well as from a GCM projection was available. These data were used to force the Max-Planck-Institute for Meteorology (MPI-M) global hydrological discharge model (HD Model). The chosen simulation setup further allows us to draw conclusions concerning the impact of the climate model resolution on the projected runoff changes.