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Drying out the Nile? Regional Climate Change and Water Resources in East Africa with a focus on Lake Victoria and Lake Tana

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The East African lakes Victoria and Tana are important local water resources for agriculture, fisheries and hydropower; they are also the main sources of the Nile. In this study we focus on the evaporative and evapotranspirative regimes of the hydrological basins for Lakes Tana and Victoria to determine how regional climate change under the A1B scenario is likely to affect the local and regional hydrology. We show results from a very high resolution (10km) simulation, where the state-of-the-art regional climate model (RCM) HIRHAM5 was driven by the global circulation model (GCM) ECHAM5 under the A1B scenario. Three time-slices have been investigated for present day (1980-1999), mid-century (2046-2065) and end of the 21st century (2080-2099) periods. Our analysis includes a comparison with a coarser 0.44o ($\sim$50 km) resolution run which demonstrates the importance of using high resolution (10km or higher) in RCM studies of this type to correctly simulate the seasonal and geographical characteristics of the present day east African monsoon system. The projections also indicate that climate change under the intermediate SRES A1B scenario is expected to cause more frequent failures of the East African rains with important consequences for the region and for the hydrology of the East African Lakes.

This work introduces the proposed DACEA (Drivers of Aridity Change in East Africa) project which aims to investigate regional and global teleconnections that affect aridity in East Africa. Future work will combine climate palaeoproxies from Lake Tana and Lake Victoria with model experiments carried out with the EC-Earth coupled Ocean-Atmosphere General Circulation Model and downscaled to very high resolution with the RCM HIRHAM5 to determine regional and global scale influences on the African monsoon system. The HIRHAM5 simulations will be dynamically coupled to a regional hydrological model based on MIKE SHE, to evaluate the consequences and the feedback from the regional hydrology of the lake basins in terms of the East African rains.