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Coupled High Resolution Climate - Hydrology Simulations for the Upper Jordan Catchment

Harald Kunstmann[1], Peter Suppan[1], Andreas Heckl[1], Alon Rimmer[2]

[1] *Forschungszentrum Karlsruhe, Institute for Meteorology and Climate Research (IMK-IFU), Germany*
[2] *Kinneret Limnological Laboratory, Israel*

Abstract

Sufficient freshwater availability is a central prerequisite for agricultural and industrial development in the water scarce environment of the near east. Political peace in the region is strongly linked to the satisfactory compliance of increasing water demands. Sustainable management of water resources requires scientific sound decisions on future freshwater availability, in particular under global climate change and increasing greenhouse gas emissions. Behind this background, the impact of climate change on water availability in the Upper Jordan River catchment (UJC) is investigated within the framework of the GLOWA-Jordan river project (www.glowa-jordan-river.de). A focus is set on the Upper Jordan in this study as it provides 1/3rd of freshwater resources in Israel. This is achieved by high resolution coupled regional climate — hydrology simulations. Two 30 year time slices (1960–1990 and 2070–2100) of the global climate model ECHAM4 are dynamically downscaled using the non-hydrostatic meteorological model MM5 in three nesting steps with resolutions of 54 km, 18 km, and 6 km. Recent emphasis is put on emission scenario B2. The meteorological fields in turn are used to drive the physically based hydrological model WaSiM applied to the UJC. The hydrological model computes in detail the surface and subsurface water flow and water balance in a horizontal resolution of 90 m and dynamically couples to a 2-dim numerical groundwater model.

Preliminary results of the regional climate simulations are presented. The ability of the hydrological model to describe the observed river discharges in this hydro-geologically extremely complex region is discussed.

The methodology presented can be applied to any region in the world.

Keywords: Distributed hydrological modelling, dynamic downscaling, regional climate modelling, water availability

Contact Address: Harald Kunstmann, Forschungszentrum Karlsruhe, Institute for Meteorology and Climate Research (IMK-IFU), Kreuzeckbahnstrasse 19, 82467 Garmisch-Partenkirchen, Germany, e-mail: harald.kunstmann@imk.fzk.de