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Mesoscale modelling of precipitation in the Atlas mountains

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ABSTRACT: Water management in semi-arid regions can be essentially improved by runoff predictions. Due to extreme soil degradation and several drought years in the area south of the Atlas mountains, the water stress might become threateningly high in the near future. One of the objectives of the IMPETUS project is the interdisciplinary investigation of the water cycle in the Oued Drâa catchment south of the Atlas mountains. The actual state of research in hydrological modelling shows that physical processes in the generation of surface water due to snowmelt- an important source of water during the dry season in the vicinity of subtropical high mountain areas- as well as the water transport within the soil and water storage in the vegetation are quite well known; the main problem is the availability of boundary data with a sufficiently high resolution and of precipitation data with an adequate high spatial and temporal resolution. From the meteorological point of view, causes of precipitation variability in Morocco are yet not fully understood; it seems to be steered by several factors such as the NAO variability, probably Atlantic SST variability and – on the smaller scale – orographically caused spatial variability. To enable investigations on different scales, a combination of nested models from the global scale down to the microscale has been arranged. The model chain consists of

- the global ECHAM/ECHO model, which is used for the generation of dry and wet scenarios,
- the synoptic-scale REMO (Regional Model), which is the further developed version of the former German Weather Services (DWD) numerical weather prediction model Europa-Modell (EM),
- the actual mesoscale nonhydrostatic numerical weather prediction model Lokalmodell (LM) of the DWD
- and the meso/microscale model FOOT3DK of the University of Cologne.

The latter three models are used for case studies and – in a later stage of the project – for the generation of rain- and snowfall climatologies for the purpose of downscaling. A study of a series of Saharian cyclogenesis in 1999 – able to produce extraordinary high precipitation south of the Atlas mountains even in summer months – will show the connection of these events to the location of the African Easterly Jet. First results of sensitivity studies, regarding to the uncertainty of boundary values, will show especially the influence of vegetation and of initial values of meteorological parameters on precipitation as snow and rain.