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Modelling hydrological processes in a semi-arid, mountainous environment under consideration of uncertainties

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Highly variable precipitation and large evaporation losses cause major water availability problems in Morocco. This is especially true for the region south of the High Atlas Mountains, upon the fringe of the Sahara, where the Drâa Valley is located. Water availability depends on different hydrological processes in the mountains and in the lowlands. High amounts of precipitation (snow and rain) in the karstic High Atlas Mountains generate reliable baseflow throughout the year, whereas rare extreme events in the basin lead to considerable but less predictable discharge. In this study the model SWAT2005 was used to quantify hydrologic processes in the 15.000 km2 semi-arid, mountainous Upper Drâa Valley. The Upper Drâa drains into the water reservoir Mansour-Eddahbi, which is of high importance for the irrigation of the downstream oases. This work has been conducted within the IMPETUS-framework, an integrated water resource management project, and will be integrated in a decision support system.

Hydrological modelling in remote, semi-arid, mountainous environments is hampered by considerable uncertainties; regarding model concepts, model parameterization and validation data. The chosen model SWAT2005 has proven capable of simulating hydrological processes in high mountain areas, as well as in arid zones. Therefore the main objectives of this study are to quantify the effects of uncertainty in model input and validation data. Most input data has been generated within IMPETUS and uncertainties have been addressed. The available soil map provides detailed information on ranges of essential parameters (available water capacity, saturated hydraulic conduc-

tivity) for 84 soil types. Further studies have been carried out to estimate the range of plant specific parameters (LAI, transpiration rates), especially for the irrigated mountain oases. In contrast to temperate zones, the distinct rainy season in subtropic regions complicates discharge measurements, in particular when storm events are extreme. On the one hand high flood magnitudes are often not covered by stage-discharge relationships, on the other hand highly variable channel beds lead to poor estimations of baseflow volume and baseflow recession. Due to these facts this study is based on discharge records derived from the level of the water reservoir Mansour-Eddahbi. The uncertainties of discharge measurements have been assessed with respect to different evapotranspiration estimations, measurement inaccuracy and siltation. This presentation focuses on the comparison of uncertainty ranges in simulated and measured discharge and highlights not only the need for proper uncertainty assessment on input and validation data, but also for goodness-of-fit-tests that are able to account for both.