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Evaluation of Regional Climate Models for the Alpine Space and Implications for Hydrological Impact Analysis

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With increasing spatial resolution of regional climate models (RCM), assessment of climate changes impact on hydrological behavior is becoming possible even for regions with complex orography like the Alps.

An evaluation of climate change data from the RCM models RegCM, REMO, HIRHAM, CLM and MM5 was performed for several areas within the Greater Alpine Region (GAR). Comparison of control runs with observed climatology revealed significant uncertainties, particularly in precipitation characteristics. It is shown that temperature and precipitation change based on different SRES scenarios and different RCMs overlap. This means e.g. that derived climate change signal of one RCM based on an optimistic emission scenario is similar to the derived climate change signal of another RCM based on a more pessimistic emission scenario.

The temperature calculations in the GAR area show an increase in monthly mean 2m-temperature at the end of the century of more then 5 K in August for the pessimistic A2 SRES emission scenario. In the more optimistic B2 emission scenario, a temperature increase in summer of up to 4 K and a moderate increase of up to 2 K in winter is deduced. In the GAR area a precipitation decrease of up 30 % in summer is expected. In the winter season, a precipitation increase of approximately 20 % is simulated by the RCMs. Specific subregions will, however, experience much higher differences, partially of more than 30 % increase in the winter season and 60 % decrease in the summer season. The models seem to agree on an increased frequency of high precip-

itation amounts in the winter season. In summer, extreme precipitation events might increase, even when the total precipitation amount will decrease in large part of the Alps.

The systematic evaluation indicates that no single model can be identified as best model and therefore hydrological impact analysis must rely on a variety of RCMs. The detected significant RCM biases both in temperature and precipitation distributions demand that hydrological climate change impact analysis must apply appropriate bias correcting techniques.