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Quantifying the performance of two conceptual models for snow dominated catchments in Austria and Turkey

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In many mountainous regions, snowmelt makes significant contribution to streamflow, particularly during spring and summer months. Understanding the magnitude and timing of this contribution and hydrological forecasts are essential for a range of purposes concerning the implications with water resources management. Conceptual hydrological models have been widely applied for mountain catchments both for operational and scientific applications. Hydrologiska Byran Vattenbalansavdelning (HBV) and Snowmelt Runoff Model (SRM) are selected in this study as the commonly used conceptual models in hydrological modeling forecasting for a number of basins in several countries. Moreover, this selection is also supported by the experiences on the improvement and application in remote sensing techniques in snow dominated regions. The greatest similarity between the two models is that each uses a temperature index method to predict melt rate whereas the greatest difference lies in the way snow cover is handled.

In mountainous regions, data limitations prevent detailed understanding of the variability of snow cover and melt. In situ snowpack measurements are sparsely distributed relative to snowpack heterogeneity therefore, to supplement ground measurements; remotely sensed images of snow covered area (SCA) provide useful information for runoff prediction during the snowmelt season. SCA has been used as a direct input to SRM and as a means of checking the internal validity for HBV model. Moderate Resolution Imaging Spectroradiometer (MODIS) daily snow cover products with 500 m spatial resolution are used to derive SCA data in this study.

A number of studies have been reported in the literature indicated that the model performance can vary depending on several factors, including the scale and characteristics of the catchment, availability of the data required and runoff producing mechanism. Therefore, five different catchments including data scare and rich basins, areas and reliefs changing in between 1000-10250 $km^2$and 1250-3050 m, respectively, in Austria and Turkey are tested to understand the impact of catchment properties on model simulations.

Both models are used to simulate runoff for the years 2001-2010 with the period of 2001-2008 and 2009-2011 for model calibration and validation, respectively. The overall model calibration performance evaluated with the model efficiency is above 0.70 and volume difference less than 10% for both of the models. Discussion of results are supervised to reflect the general debates in hydrologic modeling in terms of parameters and calibration, internal validation, the value and limitations of using satellite derived data, impact of different catchment properties with emphasis on the contrasting treatments in two widely used hydrologic models, SRM and HBV.