



The value of snow cover maps for hydrological model calibration in snow dominated catchments in Central Asia

Doris Duethmann (1), Andreas Güntner (1), Juliane Peters (2), and Sergiy Vorogushyn (1)

(1) GFZ German Research Centre for Geosciences, Section 5.4: Hydrology, Potsdam, Germany
(doris.duethmann@gfz-potsdam.de), (2) Institute for Cartography, Dresden University of Technology, Germany

This study aims at investigating the value of snow cover data in addition to discharge data for the calibration of a hydrological model in six headwater catchments of the Karadarya basin, Central Asia. If a hydrological model is to be used for the investigation of potential impacts of climate change, it is important that also internal variables are simulated correctly. Snow melt is of particular relevance, as it is probably the most important runoff generation process in these catchments. The study investigates whether there is a trade-off between good simulations with respect to discharge and with respect to snow cover area. Furthermore, we are interested in the information content of snow cover data, i.e. how many snow cover images would be sufficient for effective calibration of a hydrological model. As suitable precipitation data for the study area are only available up to 1990, MODIS snow cover data could not be used and we instead resorted to AVHRR data. Processing of the AVHRR snow cover data is time consuming, because georeferencing has to be performed manually. If only few images could already exclude parameter sets resulting in low model performance with respect to snow cover area, this would be a very valuable piece of information. In order to investigate this, a varying number of snow cover images is used for model calibration within a Monte-Carlo framework, and the effect on model performance with respect to snow cover area in the validation period is evaluated. The selected study period is 1986-1989, in which both AVHRR data and other input data are available. It is split into two parts with up to around 20 snow cover scenes for model calibration and about the same number for model validation. In most of the catchments we found only a small trade-off between good simulations with respect to discharge and with respect to snow cover area, but if the parameters were selected based on the discharge objective function only, this could also include simulations with a low performance with respect to the snow cover objective function. Increasing the number of snow cover images in the calibration period nearly always decreased the snow cover error in the validation period.