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Distributed modelling of climate change impacts on snow sublimation in Northern Mongolia

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Abstract. Sublimation of snow is an important factor of the hydrological cycle in Mongolia and is likely to increase according to future climate projections. In this study the hydrological model TRAIN was used to assess spatially distributed current and future sublimation rates based on interpolated daily data of precipitation, air temperature, air humidity, wind speed and solar radiation. An automated procedure for the interpolation of the input data is provided. Depending on the meteorological parameter and the data availability for the individual days, the most appropriate interpolation method is chosen automatically from inverse distance weighting, Ordinary Least Squares interpolation, Ordinary or Universal Kriging. Depending on elevation simulated annual sublimation in the period 1986–2006 was 23 to 35 mm, i.e. approximately 80% of total snowfall. Moreover, future climate projections for 2071–2100 of ECHAM5 and HadCM3, based on the A1B emission scenario of the Intergovernmental Panel on Climate Change, were analysed with TRAIN. In the case of ECHAM5 simulated sublimation increases by up to 17% (26...41 mm) while it remains at the same level for HadCM3 (24...34 mm). The differences are mainly due to a distinct increase in winter precipitation for ECHAM5. Simulated changes of the all-season hydrological conditions, e.g. the sublimation-to-precipitation ratio, were ambiguous due to diverse precipitation patterns derived by the global circulation models.

Full Article in PDF (PDF, 2336 KB)

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