Applications of regional climate change projections in the upper Danube and upper Brahmaputra river basin

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To assess climate change on the regional scale, large-scale projections from the general circulation model
ECHAM5 have been dynamically downscaled with the regional climate model CLM from about 2° grid resolution
to 0.44°. This has been done in two alpine regions, one containing the upper Danube river basin (UDRB) in the
European Alps, the other containing the upper Brahmaputra river basin (UBRB) in the Himalayas. This paper
focuses on applications using these regional climate projections and their uncertainties in the two river basins from
different IPCC SRES scenario runs for the simulation period 1960-2100. We discuss the challenges of different
applications and the necessity and possibility of model bias removing techniques. To this end, we use the examples
of: (1) climate change studies based on daily to yearly projections of indices for precipitation, temperature and the
south Asian summer Monsoon, (2) projections of glacier retreat, and (3) forcing of a hydrological model.

For the climate change studies mean values and variability are considered. Here, a normalization with re-
spect to some reference period is sufficient to remove most of the model biases. Contrary, for the projections
of glacier retreat and the forcing of a hydrological value, more complex bias correction methods are needed to
provide accurate input data to the impact models. These bias correction methods are challenged for instance in
the south Asian region by the high seasonality of the model precipitation bias in combination with scarceness of
precipitation events during winter which makes a robust model bias estimation impossible.