



Future hydrological regimes of the upper Indus basin: a preliminary assessment

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The mountain regions of the Hindu Kush, Karakoram and Himalaya (HKKH) are the “third polar ice cap” of our planet, as the great Asiatic mountain chains contain the largest ice masses outside the Polar Regions. Therein, glaciers play the role of “water towers” by providing significant amount of melt water, especially in the dry season, essential for agriculture, drinking purposes, and hydropower production. Recently, most glaciers in the HKKH have been retreating and losing mass, mainly due to significant regional warming, thus calling for assessment of future water resources availability for populations down slope. In this preliminarily study, future (2060) hydrological flows in a particular watershed (Shigar river @ Shigar, ca 7000 km²), nested within the upper Indus basin, and fed by seasonal melt from two major glaciers (Baltoro and Biafo), are investigated.

The study is carry out under the umbrella of the SHARE-Paprika project, aiming at evaluating the impact of climate change upon hydrology of the upper Indus river. The project is funded by the EvK2CNR Committee of Italy, which is providing the ground based climatic data from the meteo stations within the area.

We set up a minimal hydrological model, tuned against the observed ground climatic data, in situ measured ablation data, and remotely sensed snow cover data, useful to build future hydrological scenarios. The future, locally adjusted, precipitation and temperature (A2 storyline) fields from GCMs available within the IPCC's are then fed to the hydrological model. The projected flow duration curves, some selected flow descriptors, and the significance of modified flow regimes via ensemble repetitions are evaluated. We then comment the modified snow cover, ice ablation regime and implications for water resources, and also the modified evapotranspiration and soil water content patterns, all displaying sensitivity to the chosen GCM model. The uncertainty of the results is then addressed, and future research questions are discussed.

Keywords: Karakoram; climate change; snow cover; ice ablation; water resources.