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Future Perspectives Of Run-Of-The-River Hydropower In The Italian Alps

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The present work sets the objective of assessing the effects of climate change on the hydrological regime of glacierized river basins and how this could impact the production of hydroelectricity. The study was conducted by examining 42 basins, distributed homogeneously across the Italian Alpine regions. Each of these basins includes one (or more) hydropower plants, here treated as run-of-the-river systems. We considered 9 different climate change scenarios that take into account the individual and combined effects of increases in temperatures and variations in liquid – solid phase partition. The simulation horizon is 2016-2065. We therefore avoided long-term extrapolations and worked at short – medium range, with important implications for decision makers. To simulate incoming stream flow at each plant, a conceptual, semi-distributed rainfall-runoff model has been implemented. The model divides the basin in elevation bands and takes into account orographic effects to both precipitation and temperature. The model is conceived for non-instrumented basins (i.e. ungauged basins), and the parameters are therefore all determined a priori on the basis of topographic information, observed precipitation, and temperature. The accuracy of the model's results is evaluated in six sites in which we have the observed discharge series. Uncertainty is evaluated through Monte Carlo simulations to consider also the variability of the meteorological inputs. Results show that variations of climate regime influence adversely the hydroelectric production. A positive gradient in temperature and the absence of solid precipitation in particular reveal a decrease in the hydropower production.

Key words: Climate Change, Monte Carlo, Hydroelectric Production, Uncertainty.