Geophysical Research Abstracts
Vol. 17, EGU2015-10401, 2015
EGU General Assembly 2015

Assessment of potential for small hydro/solar power integration in a mountainous, data sparse region: the role of hydrological prediction accuracy

Marco Borga (1), Baptiste Francois (2), Jean-Dominique Creutin (2), Benoit Hingray (2), Davide Zoccatelli (1), and Gianmarco Tardivo (1)

(1) Università di Padova, Dip. Territorio e Sistemi Agro-Forestali, Legnaro, Italy , (2) LTHE – Université de Grenoble 1/CNRS, 38041 Grenoble, France,

In many parts of the world, integration of small hydropower and solar/wind energy sources along river systems is examined as a way to meet pressing renewable energy targets. Depending on the space and time scales considered, hydrometeorological variability may synchronize or desynchronize solar/wind, runoff and the demand opening the possibility to use their complementarity to smooth the intermittency of each individual energy source. Rivers also provide important ecosystem services, including the provision of high quality downstream water supply and the maintenance of in-stream habitats. With future supply and demand of water resources both impacted by environmental change, a good understanding of the potential for the integration among hydropower and solar/wind energy sources in often sparsely gauged catchments is important. In such cases, where complex data-demanding models may be inappropriate, there is a need for simple conceptual modelling approaches that can still capture the main features of runoff generation and artificial regulation processes.

In this work we focus on run-of-the-river and solar-power interaction assessment. In order to catch the three key cycles of the load fluctuation - daily, weekly and seasonal, the time step used in the study is the hourly resolution. We examine the performance of a conceptual hydrological model which includes facilities to model dam regulation and diversions and hydrological modules to account for the effect of glaciarised catchments. The model is applied to catchments of the heavily regulated Upper Adige river system (6900 km2), Eastern Italian Alps, which has a long history of hydropower generation. The model is used to characterize and predict the natural flow regime, assess the regulation impacts, and simulate co-fluctuations between run-of- the-river and solar power. The results demonstrates that the simple, conceptual modelling approach developed here can capture the main hydrological and regulation processes well at the three key cycles of the load fluctuations. A specific focus is dedicated on how the results can be communicated to stakeholders in order to provide a basis for discussing the development of new adaptive management strategies.