Geophysical Research Abstracts
Vol. 16, EGU2014-5761, 2014
EGU General Assembly 2014

Integrating hydropower and intermittent climate-related renewable energies: a call for hydrology

Baptiste FRANCOIS (1), Sandrine Anquetin (2,3), Jean-Dominique Creutin (2,3), Kolbjorn Engeland (7,8), Anne-Catherine Favre (3,2), Benoit Hingray (2,3), Maria-Helena Ramos (6), Damien Raynaud (2,3), Benjamin Renard (5), Eric Sauquet (5), Julian-Friedrich Sauterleute (4), Jean-Philippe Vidal (5), and Geir Warland (4)

(1) University of Padova, Agripolis, Department of Land, Environment, Agriculture and Forestry, Italy (baptiste.francois@ujf-grenoble.fr), (2) LTHE – Université de Grenoble 1/CNRS, 38041 Grenoble, France, (3) LTHE – Université de Grenoble 2/G-INP, 38041 Grenoble, France, (4) SINTEF Energy Research, PO 4761 Sluppen, 7465 Trondheim, Norway, (5) IRSTEA Lyon, Hydrology-Hydraulics Research Unit, 69626, Villeurbanne, France, (6) IRSTEA, UR HBAN, Hydrology Group, Antony, France, (7) University of Olso, Dept. Geosciences, PO box 10470316 Olso, Norway, (8) Norwegian Water Resources and Energy Directorate, PO box 5091 Majorstuen 0301 Oslo, Norway

Currently, the debate about the role of hydropower as energy storage and balancing energy source in context of high intermittency and variability of solar and wind energy exposes hydrologists to new challenges. There is a common consensus that a high penetration of wind and solar energies can only be achieved if the issues to their intermittent power outputs are solved – issues which can be at least partially approached by means of hydropower systems. Indeed, unlike wind and solar energies which are only produced when wind and sun are available, hydro resources can be stored in reservoirs for later use. Finally, the energy production should balance the energy demand which is to a large degree, controlled by weather variables, especially temperature. However, despite substantial work on the space-time variability of each individual hydro-meteorological variable, advances on the joint analysis of the processes that are underlying this integration are more limited.

In this commentary, we analyze three specific challenges dedicated to the hydrological community. They aim to improve the integration of hydropower with solar and wind energy sources to make more effective the use of renewable energy and water resources. These challenges are: i) the need to provide a new hydro-meteorological framework for the analysis of the space-time co-fluctuations between runoff regimes and solar, wind and temperature variables; ii) understanding how processes like land-use and climate change affect the nature of these co-fluctuations; and iii) the need to develop means for a quantitative analysis of interactions between the use of water for power generation and other water uses including the preservation of aquatic ecosystems.

In some way, the success of climate change mitigation policies based on high intermittent energy integration will depend on how these different challenges have been achieved by hydrologist community.

The work presented is part of the FP7 project COMPLEX (Knowledge based climate mitigation systems for a low carbon economy; http://www.complex.ac.uk/). A related invited commentary is going to be submitted to the “Hydrological Processes Today” journal.