Geophysical Research Abstracts
Vol. 19, EGU2017-9299, 2017
EGU General Assembly 2017

Modelling snow melt contribution to discharge at the scale of a large river basin

Isabelle Gouttevin (1), Maxime Turko (2,1), Sven Kralisch (3), and Flora Branger (1)

(1) IRSTEA, Lyon, France (isabelle.gouttevin@irstea.fr), (2) CNES / Université Toulouse III, Toulouse, France (maxime.turko@gmail.com), (3) Geography Institute, University of Jena, Jena, Germany (sven.kralisch@uni-jena.de)

Hydrological modelling is often a key prerequisite for water management in large river basins. However, few models feature an appropriate representation of hydrology over the broad range of hydro-climatic conditions than can exist within such basins.
Here, we modify the snow scheme of the J2000-Rhone hydrological model to improve its performances in mountainous regions : the model is routinely deployed over the whole Rhone river catchment ($\sim$ 100 000 km2), 1/3 of which lies above 1000 m a.s.l. and contributes to the majority of the spring and summer discharge, that is of importance for hydro-power production and downstream water uses like irrigation and recreational activities. The model includes a representation of these uses, and has been designed as a tool to help water management and its adaptation in future climate.
While a temperature-index approach is retained for compliance with mostly available meteorological data and the overall model complexity of J2000-Rhone, several refinements of the simple degree-day formulation are tested and evaluated. They include bi-daily melt formulation, seasonal variations of the melt-factor, and regional-scale calibration thereof. We also evaluate the impact of (i) meteorological forcing, (ii) model spatial resolution, and (iii) forcing spatial resolution, making use of two meteorological reconstructions available over the past 25 years. Model performances are assessed by comparison to observed hydrographs, but also other available ancillary data.
Differences in model performances are mainly carried by the meteorological data. Once meteorology allows for reasonable performances, melt formulation can still considerably improve model performances over the melt season and overall. The changes in model performances (or lack thereof) upon changes in spatial resolution of the model and of the forcing are discussed.
Our methodological work leads to the local selection of the meteorological forcing, melt-formulation and spatial resolution relevant for water resource assessment over our study area.