7th International Water Resources Management Conference of ICWRS,
18–20 May 2016, Bochum, Germany, IWRM2016-58

Transposing discharge measured time series: large comparison of top-kriging with geomorphology-based inverse modeling

de Lavenne A. (1), Skøien J.O. (2), Cudennec C. (3,4), Curie F. (1), Moatar F. (1)

(1) Irstea, Hydrosystems and Bioprocesses Research Unit (HBAN), Antony, France
(2) European Commission, Joint Research Centre, Institute for Environment and Sustainability, Ispra, Italy
(3) AGROCAMPUS OUEST, UMR1069, Sol Agro et hydrosystème Spatialisation, Rennes, France
(4) INRA, UMR1069, Sol Agro et hydrosystème Spatialisation, Rennes, France
(5) Université François Rabelais – Tours, EA 6293, Géo-Hydrosystèmes Continentaux, Tours, France

Water management rely on streamflow measurement. It provides the most reliable knowledge about quantity and dynamics of water flowing through the river catchment. When focusing on the spatial dimensions of water management, this information is mainly limited by the density of measurement stations which often can not fulfill every needs.

This issue meets the last IAHS decade which was focused on prediction of ungauged catchments and produced large amount of literature. For continuous streamflow simulation purposes, many of those works have faced this question through the development of regionalization approaches to apply rainfall-runoff models at any ungauged locations. However, few methods are based on transposition of direct streamflow observations. Such approaches have yet several advantages (no model's simplifying assumptions, uncertainty of its parameters and structure). Runoff observations also naturally integrate human impact which can be challenging to model in a consistent way, such as the influence of a dam or the influence of water withdrawal for irrigation.

We apply two different approaches that aim to transpose hourly discharge time series measurement to surrounding ungauged locations: the top-kriging approach and a geomorphology-based inverse modeling. Both techniques are applied on 389 catchments of the French Loire river catchment (about 110 000 km^2) between 2000 and 2013. Whereas top-kriging analyses spatial correlation, the compared approach has the advantage of being more naturalistic by using a well known geomorphology-based component of hydrological model and its inversion. Both approaches need similar calibration and provide very closed performances. It is demonstrated that the Ghosh distance provides an efficient weighting approach for choosing and weighting the ability of gauged catchments to be an efficient donor. This results is particularly relevant for large catchments where considering the nested structure between gauged and ungauged catchments is crucial.