IAHS2017-375
IAHS Scientific Assembly 2017

Can our models be run at any time step without caution? Diagnosis of structural modelling flaws through fluxes consistency

Andrea Ficchí, Charles Perrin, and Vazken Andréassian
Irstea, Hydrosystem Research Unit, Antony Cedex, France (charles.perrin@irstea.fr)

Predicting the impact of various environmental changes on water resources is a key issue and hydrological models are essential tools for this objective. Models are designed at various time and spatial resolutions and finding the optimal scales for modelling remains a difficult question. Though many researches were carried out on spatial scales, the issue of time scale was much less investigated.
This research aimed at diagnosing the impact of time step on the results of conceptual models. Our starting point is the chain of conceptual rainfall-runoff models called 'GR' and in particular the daily 'GR4J' lumped model. For our modelling tests, we built a database of 240 unregulated catchments in metropolitan France, at multiple time steps, from 6-minute to 1 day, using fine time step hydro-climatic datasets available. We investigated the impact of the inputs temporal distribution on model outputs and performance in a flood simulation perspective based on 2400 selected flood events.
Our model evaluation focused on the consistency of model internal fluxes at different time steps, in order to ensure obtaining a satisfactory model performance by a coherent model functioning at multiple time steps. Our model diagnosis showed that neglecting interception losses at sub-daily time steps led to a significant degradation of results. Hence neglecting the structural consistency of models throughout time steps may limit model robustness and therefore the ability of models to predict changes.