



Addressing model structural uncertainty in PUBs via Bayesian approach

Cristina Prieto (1,2,3), Nataliya Le-Vine (1), Claudia Vitolo (4), and Raúl Medina (3)

(1) Imperial College London, United Kingdom (c.prieto13@alumni.imperial.ac.uk), (2) University of Bristol, Civil Engineering, Bristol, United Kingdom, (3) Environmental Hydraulics Institute "IH Cantabria". University of Cantabria, Santander, Spain, (4) European Centre for Medium-range Weather Forecasts, United Kingdom.

A catchment is a complex system where a multitude of interrelated energy, water and vegetation processes occur at different temporal and spatial scales. A rainfall-runoff model is a simplified representation of the system, and serves as a hypothesis about catchment inner working. In predictions for ungauged basins, a common practice is to use a pre-selected model structure for a catchment, while there is usually no justification for its suitability (due to the lack of observed flows). This research aims moving beyond the 'one size fits all' problem. First, two metrics are proposed to assess suitability and adequacy of a selected model based on a) how well the model reproduces regionalised information, b) knowledge gain from considering the model over what is known from regionalisation alone. Second, dominant hydrological mechanisms (to be included into a model) are identified using the regionalised information via Bayesian approach. And third, available model structures are ranked and weighed based on their skill to support regionalised information, and then used in a multi-model ensemble to provide probabilistic predictions. The methodology is applied to basins in Northern Spain with varied hydroclimatological regimes. The results show that prediction quality is sensitive to model (or ensemble) error, quality of regionalised information, and available information content.