



Catchment Prediction In Changing Environments (CAPICHE): A collaborative experiment in an open water science laboratory

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Predicting the function of hydrological systems under near-stationary conditions faces a number of challenges due to incomplete system understanding, and uncertainty in models and measurements. However, due to changes in climate, land use/land cover, and water demand, the hydrological function of many catchments cannot be considered as stationary. Such changes make modelling catchment systems more difficult, as models need to account for non-stationary forcing and boundary conditions, which in turn can change internal catchment function, and the states and processes that dominate hydrological response. In addition, such models may need to be used to make predictions beyond a range of conditions for which they were originally calibrated. Despite these problems, deriving accurate hydrological predictions under changing conditions is increasingly important for future water resource and flood hazard assessment. Simulating catchments under changing conditions may require more complex distributed models in order to adequately represent spatial changes in boundary conditions (e.g. land cover change). However, the potential for complex models to address these issues cannot be realised in many places because of data problems, which may result from a lack of data, data access issues, and time-consuming problems in bringing diverse sources of data together and into a useable format. A greater understanding of the link between model complexity and data is required to make appropriate modelling choices.

Virtual water science laboratories offer the ideal opportunity to explore the issues of model complexity and data availability in the context of predictions under changing environments because they: (1) provide an opportunity to share open data; (2) provide a platform to compare different models; (3) facilitate collaboration between different modelling research groups. This paper introduces a new collaborative experiment, conducted in an open virtual water science laboratory as part of the EC FP7 funded project Switch-On: CAtchment Prediction In Changing Environments (CAPICHE). The aims of the collaborative experiment are to: gain a thorough, comparative understanding of how different models simulate catchments under changing environments; understand how the ability of different models to simulate catchments under change is affected by data availability, and therefore identify appropriate model structures given available data; identify what hydrological signatures, and therefore what model behaviours are most sensitive to model structure, data availability and parameter uncertainty when simulating under changing conditions; identify gaps in existing open data sources according to modelling requirements. Interested researchers are invited to consider potential collaboration.