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Can citizen-based observations be assimilated in hydrological models to improve flood prediction?

Maurizio Mazzoleni (1), Leonardo Alfonso (1), Dimitri P Solomatine (1,2)
(1) UNESCO-IHE, Delft, The Netherlands, (2) TU Delft, Delft, The Netherlands

In the recent years, the continued technological improvement has stimulated the spread of low-cost sensors that can be used to measure hydrological variables by citizens in a more spatially distributed way than classic static physical sensors. However, such measurements have the main characteristics to have irregular arrival time and variable uncertainty. This study presents a Kalman filter based method to integrate citizen-based observations into hydrological models in order to improve flood prediction.
The methodology is applied in the Brue catchment, South West of England. In order to estimate the response of the catchment to a given flood event, a lumped conceptual hydrological model is implemented. The measured precipitation values are used as perfect forecast input in the hydrological model. Synthetic streamflow values are used in this study due to the fact that citizen-based observations coming at irregular time steps are not available.
The results of this study pointed out how increasing the number of uncertain citizen-based observations within two model time steps can improve the model accuracy leading to a better flood forecast. Therefore, observations uncertainty influences the model accuracy more than the irregular moments in which the streamflow observations are assimilated into the hydrological model. This study is part of the FP7 European Project WeSenseIt Citizen Water Observatory (http://wesenseit.eu/).