Geophysical Research Abstracts
Vol. 19, EGU2017-13118, 2017
EGU General Assembly 2017
© Author(s) 2017. CC Attribution 3.0 License.

Effect of citizen engagement levels in flood forecasting by assimilating crowdsourced observations in hydrological models

Maurizio Mazzoleni (1), Juliette Cortes Arevalo (2), Leonardo Alfonso (3), Uta Wehn (4), Daniele Norbiato (5), Martina Monego (6), Michele Ferri (7), Dimitri Solomatine (8,9)

(1) UNESCO IHE, Institute for Water Education, Delft, Netherlands (m.mazzoleni@unesco-ihe.org), (2) University of Twente, Enschede, The Netherlands (v.j.cortesarevalo@utwente.nl), (3) UNESCO IHE, Institute for Water Education, Delft, Netherlands (l.alfonso@unesco-ihe.org), (4) UNESCO IHE, Institute for Water Education, Delft, Netherlands (u.wehn@unesco-ihe.org), (5) Alto Adriatico Water Authority, Venice, Italy (daniele.norbiato@adbve.it), (6) Alto Adriatico Water Authority, Venice, Italy (martina.monego@adbve.it), (7) Alto Adriatico Water Authority, Venice, Italy (michele.ferri@adbve.it), (8) UNESCO IHE, Institute for Water Education, Delft, Netherlands (d.solomatine@unesco-ihe.org), (9) Water Resources Section, Delft University of Technology, The Netherlands

In the past years, a number of methods have been proposed to reduce uncertainty in flood prediction by means of model updating techniques. Traditional physical observations are usually integrated into hydrological and hydraulic models to improve model performances and consequent flood predictions. Nowadays, low-cost sensors can be used for crowdsourced observations. Different type of social sensors can measure, in a more distributed way, physical variables such as precipitation and water level. However, these crowdsourced observations are not integrated into a real-time fashion into water-system models due to their varying accuracy and random spatial-temporal coverage.

We assess the effect in model performance due to the assimilation of crowdsourced observations of water level. Our method consists in (1) implementing a Kalman filter into a cascade of hydrological and hydraulic models. (2) defining observation errors depending on the type of sensor either physical or social. Randomly distributed errors are based on accuracy ranges that slightly improve according to the citizens' expertise level. (3) Using a simplified social model to realistically represent citizen engagement levels based on population density and citizens' motivation scenarios.

To test our method, we synthetically derive crowdsourced observations for different citizen engagement levels from a distributed network of physical and social sensors. The observations are assimilated during a particular flood event occurred in the Bacchiglione catchment, Italy.

The results of this study demonstrate that sharing crowdsourced water level observations (often motivated by a feeling of belonging to a community of friends) can help in improving flood prediction. On the other hand, a growing participation of individual citizens or weather enthusiasts sharing hydrological observations in cities can help to improve model performance. This study is a first step to assess the effects of crowdsourced observations in flood model predictions. Effective communication and feedback about the quality of observations from water authorities to engaged citizens are further required to minimize their intrinsic low-variable accuracy.