Geophysical Research Abstracts
Vol. 16, EGU2014-6614-1, 2014
EGU General Assembly 2014

Assimilation of soil moisture observations from remote sensing in operational flood forecasting

Maurizio Mazzoleni (1), Leonardo Alfonso (1), Michele Ferri (2), Martina Monego (2), Daniele Norbiato (2), Dimitri P. Solomatine (1,3)

(1) UNESCO-IHE Institute for Water Education, Delft, Netherlands, (2) Alto Adriatico Water Authority, Cannaregio, Venezia, Italy, (3) Water Resources Section, Delft University of Technology, The Netherlands

Flooding and the resulting damages occurred in Europe in recent decades showed that the need of a preparation to critical events can be considered as a key factor in reducing their impact on society. It has been shown that early warning systems may reduce significantly the direct and indirect damages and costs of a flood impact. In order to improve the forecasting systems, data assimilation methods were proposed in the last years to integrate real-time observations into hydrological and hydrodynamic models. The aim of this work is to assimilate observations of soil moisture into an operational flood forecasting system in Italy in order to evaluate the effect on the water level along the main river channel.

The methodology is applied in the Bacchiglione catchment, located in the North of Italy, having a drainage area of about 1400 km2, length of main reach of 118km and average discharge of 30m3/s at Padova. In order to represent this system, the Bacchiglione basin was considered as a set of different sub-basins characterized by its own hydrologic response and connected each other mainly by propagation phenomena. A 1D hydrodynamic model was then used to estimate water level along the main channel.

The assimilation of the soil moisture observations was carried out using a variant of the Kalman filter-based technique. The main idea of this study was to update the model state (the soil water capacity) as response of the distributed information of soil moisture, and then estimate the flow hydrograph at the basin outlet. As a basis we used the approach by Brocca et al.(2012), using a different model structure and with adaption allowing for real-time use.

The results of this work show how the added value of soil moisture into the hydrological model can improve the forecast of the flow hydrograph and the consequent water level in the main channel. This study is part of the FP7 European Project WeSenseIt.

[1] Brocca, L., Moramarco, T., Melone, F., Wagner, W., Hasenauer, S., and Hahn, S. (2012) Assimilation of Surface- and Root-Zone ASCAT Soil Moisture Products Into Rainfall–Runoff Modeling, IEEE Transactions on Geoscience and Remote Sensing, 50(7), 2542-2555