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Development of web-based services for an ensemble flood forecasting and risk assessment system

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Flooding is a wide spread and devastating natural disaster worldwide. Floods that took place in the last decade in China were ranked the worst amongst recorded floods worldwide in terms of the number of human fatalities and economic losses (Munich Re-Insurance). Rapid economic development and population expansion into low lying flood plains has worsened the situation. Current conventional flood prediction systems in China are neither suited to the perceptible climate variability nor the rapid pace of urbanization sweeping the country. Flood prediction, from short-term (a few hours) to medium-term (a few days), needs to be revisited and adapted to changing socio-economic and hydro-climatic realities.
The latest technology requires implementation of multiple numerical weather prediction systems. The availability of twelve global ensemble weather prediction systems through the 'THORPEX Interactive Grand Global Ensemble' (TIGGE) offers a good opportunity for an effective state-of-the-art early forecasting system. A prototype of a Novel Flood Early Warning System (NEWS) using the TIGGE database is tested in the Huai River basin in east-central China. It is the first early flood warning system in China that uses the massive TIGGE database cascaded with river catchment models, the Xinanjiang hydrologic model and a 1-D hydraulic model, to predict river discharge and flood inundation.

The NEWS algorithm is also designed to provide web-based services to a broad spectrum of end-users. The latter presents challenges as both databases and proprietary codes reside in different locations and converge at dissimilar times. NEWS will thus make use of a ready-to-run grid system that makes distributed computing and data resources available in a seamless and secure way. An ability to run or function on different operating systems and provide an interface or front that is accessible to broad spectrum of end-users is additional requirement. The aim is to achieve robust interoperability through strong security and workflow capabilities. A physical network diagram and a work flow scheme of all the models, codes and databases used to achieve the NEWS algorithm are presented. They constitute a first step in the development of a platform for providing real time flood forecasting services on the web to mitigate 21st century weather phenomena.