Geophysical Research Abstracts
Vol. 14, EGU2012-3993, 2012
EGU General Assembly 2012

Looking at the big scale - Global Flood Forecasting

P. Burek (1), L. Alfieri (1), J. Thielen-del Pozo (1), D. Muraro (1), F. Pappenberger (2), and B. Krzeminsk (2)
(1) European Commission - Joint Research Centre (JRC), (2) European Centre for Medium-Range Weather Forecasts (ECMWF)

Reacting to the increasing need for better preparedness to worldwide hydrological extremes, the Joint Research Centre has joined forces with the European Centre for Medium-Range Weather Forecast (ECMWF), to couple state-of-the art weather forecasts with a hydrological model on global scale. On a pre-operationally basis a fully hydro-meteorological flood forecasting model is running since July 2011 and producing daily probabilistic discharge forecast with worldwide coverage and forecast horizon of about 1 month. An important aspect of this global system is that it is set-up on continental scale and therefore independent of administrative and political boundaries – providing downstream countries with information on upstream river conditions as well as continental and global overviews.

The prototype of a Global Flood Alert System consists of HTESSEL land surface scheme coupled with LISFLOOD hydrodynamic model for the flow routing in the river network. Both hydrological models are set up on global coverage with horizontal grid resolution of 0.1° and daily time step for input and output data.

To estimate corresponding discharge warning thresholds for selected return periods, the coupled HTESSEL-LISFLOOD hydrological model is driven with ERA-Interim input meteorological data for a 21 year period from 1989 onward. For daily forecasts the ensemble stream flow predictions are run by feeding Variable Resolution Ensemble Prediction System (VarEPS) weather forecasts into the coupled model. VarEPS consist of 51-member ensemble global forecasts for 15 days. The hydrological simulations are computed for a 45-day time horizon, to account the routing of flood waves through large river basins with time of concentration of the order of one month.

Both results, the discharge thresholds from the long term run and the multiple hydrographs of the daily ensemble stream flow prediction are joined together to produce probabilistic information of critical threshold exceedance. Probabilistic discharge forecasts are compared with three warning threshold maps. Results are displayed through a password protected web-portal where the members can browse in an easy and intuitive way different aspects of the most recent or past forecasts as spatially distributed information. Critical points in the river channels showing an increased probability of flooding over various forecasts are linked to time series of flood threshold exceedances in order to provide more detailed information.

Although the system is still in its infancy and requires further research and development, rigorous testing and adaptations, it has already demonstrated its potential in recent catastrophic floods. The severe floods in Pakistan in July-August 2010 were clearly detected by the system as a major flood event. Recent examples are the floods in the South-Eastern Asia (mainly Thailand, Cambodia and Vietnam) in September-October 2011. For the lower Mekong River, probabilistic forecasts from the global simulations on 18th September 2011 showed a probability higher than 40% of exceeding the high alert level from 2nd to 4th October, hence 14 days in advance. Regarding the devastating monsoon flooding in Thailand, the peak flow of the Chao Phraya River was forecast since mid of September 2011, about 10-15 days before the actual peak occurred and the major losses took place.