Geophysical Research Abstracts
Vol. 14, EGU2012-1741, 2012
EGU General Assembly 2012

Non-parametric data-based approach for the quantification and communication of uncertainties in river flood forecasts

N. Van Steenbergen and P. Willems
KU Leuven, Hydraulics Division, Heverlee, Belgium (niels.vansteenbergen@bwk.kuleuven.be)

Reliable flood forecasts are the most important non-structural measures to reduce the impact of floods. However flood forecasting systems are subject to uncertainty originating from the input data, model structure and model parameters of the different hydraulic and hydrological submodels. To quantify this uncertainty a non-parametric data-based approach has been developed. This approach analyses the historical forecast residuals (differences between the predictions and the observations at river gauging stations) without using a predefined statistical error distribution. Because the residuals are correlated with the value of the forecasted water level and the lead time, the residuals are split up into discrete classes of simulated water levels and lead times. For each class, percentile values are calculated of the model residuals and stored in a 'three dimensional error' matrix. By 3D interpolation in this error matrix, the uncertainty in new forecasted water levels can be quantified.
In addition to the quantification of the uncertainty, the communication of this uncertainty is equally important. The communication has to be done in a consistent way, reducing the chance of misinterpretation. Also, the communication needs to be adapted to the audience; the majority of the larger public is not interested in in-depth information on the uncertainty on the predicted water levels, but only is interested in information on the likelihood of exceedance of certain alarm levels. Water managers need more information, e.g. time dependent uncertainty information, because they rely on this information to undertake the appropriate flood mitigation action. There are various ways in presenting uncertainty information (numerical, linguistic, graphical, time (in)dependent, etc.) each with their advantages and disadvantages for a specific audience. A useful method to communicate uncertainty of flood forecasts is by probabilistic flood mapping. These maps give a representation of the probability of flooding of a certain area, based on the uncertainty assessment of the flood forecasts. By using this type of maps, water managers can focus their attention on the areas with the highest flood probability. Also the larger public can consult these maps for information on the probability of flooding for their specific location, such that they can take pro-active measures to reduce the personal damage.
The method of quantifying the uncertainty was implemented in the operational flood forecasting system for the navigable rivers in the Flanders region of Belgium. The method has shown clear benefits during the floods of the last two years.