Geophysical Research Abstracts
Vol. 12, EGU2010-13299, 2010
EGU General Assembly 2010

Simple fuzzy logic estimation of flow forecast uncertainty

Jan Danhelka
Czech Hydrometeorological Institute, Praha, Czech Republic (danhelka@chmi.cz)

Fuzzy logic is recognized as useful tool to support for decision making under uncertainty. As such some methods for reservoir operation or real time flood management were developed. Maskey (2004) describes method of model uncertainty assessment based on qualitative expert judgement and its representation in fuzzy space. It is based on categorical judging of the quality and importance of selected model parameters (processes).
The method was modified in order to reflect varying uncertainty of single model realization (forecast) with respect to inputting precipitation forecast (QPF). Two model uncertainty parameters were distinguish: 1) QPF, 2) model uncertainty due to concept and parameters.
The approach was tested and applied for Černá river basin (127 km2) in southern Bohemia for the period from January 2008. Aqualog forecasting system (SAC-SMA implemented) is used for real time forecasting within the basin. It provides deterministic QPF based (NWP ALADIN) forecast with 48 h lead time. The aim of the study was to estimate the uncertainty of the forecast using simple fuzzy procedure.
QPF uncertainty dominates the total uncertainty of hydrological forecast in condition of the Czech Republic. Therefore an evaluation of QPF performance was done for the basin. Based on detected quantiles of relative difference the fuzzy expression of QPF exceedance probability was done to represent the quality of QPF parameter. We further assumed that the importance of QPF parameter is proportional to its quality.
Model uncertainty was qualitatively estimated to be moderate both in quality and importance.
Than the fuzzy sum of both parameters was computed. The output is than fitted to deterministic flow forecast using the highest forecasted flow and its known reference in fuzzy space (determined according to QPF performance evaluation).
The case study provided promising results in the meaning of Brier skill score (0.24) as well as in comparison of forecasted to expected distribution of bins frequency occurrence.
A simple postprocessing tool has been developed and applied for the basin in forecasting operation since beginning of 2010.

Maskey, S. (2004): Modelling Uncertainty in Flood Forecasting Systems, Taylor&Francis, London, p. 177