Geophysical Research Abstracts,
Vol. 11, EGU2009-12488, 2009
EGU General Assembly 2009

The skill of probabilistic precipitation forecasts under observational uncertainties within the Generalized Likelihood Uncertainty Estimation framework for hydrological applications

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A methodology to evaluate ensemble forecasts taking into account observational uncertainties for catchment based precipitation averages is introduced. Probability distributions for mean catchment precipitation are derived with the Generalized Likelihood Uncertainty Estimation (GLUE) method. The observation uncertainty includes errors in the measurements, uncertainty due to the inhomogeneities in the rain gauges network and representativeness errors introduced by the interpolation methods. The closeness of the forecast probability distribution to the observed fields is measured using the Brier skill score, rank histograms, relative entropy, and the ratio between the ensemble spread and the error of the ensemble-median forecast (spread/error ratio). Four different methods have been used to interpolate observations on the catchment regions. Results from a 43-day period (from 20 July to 31 August 2002) show little sensitivity to the interpolation method used. The rank histograms and the relative entropy better show the impact of introducing observation uncertainty, while this impact on the Brier skill score and the spread/error ratio is not very large. The case study indicates than overall observation uncertainty should be taken into account when evaluating forecast skill.