Geophysical Research Abstracts
Vol. 14, EGU2012-711, 2012
EGU General Assembly 2012

Application and improvement of BFS in Flood forecasting

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Since the existence of flood forecasting uncertainties have been widely accepted gradually recently, how to quantitatively describe these uncertainties and achieve probabilistic forecasting becomes a hot topic. To realize probabilistic flood forecasting, the hydrologic uncertainty processor (HUP) within Bayesian forecasting system (BFS) was employed to investigate the hydrologic forecasting uncertainties in the article, and then probabilistic flood forecasting was realized. As a determinate hydrological model, Xin'anjiang model which is widespreadly applied in humid region was used to yield initial discharge forecasting series, meanwhile, the posterior distribution of discharge could be solved with selected prior distribution and likelihood function based on Bayesian theory, then, the probabilistic flood forecasting results at any time during the duration of flood hydrograph could be obtained according to the posterior distribution of discharge. It needs to point out that the method can not only achieve a good precision but also provide rich uncertainty information such as average, variance, quantile of different confidence interval and so on. In research or practice, the mean value of posterior distribution of discharge is always adopted as the final forecasting result. Analyzing the statistical characteristic of the ultimate forecasting results, a law that the forecasting precision is higher when the discharge magnitude is large was discovered. To overcome the disadvantage that forecasting accuracy is lower in the case of small discharge magnitude, according to the magnitude of the forecasting results, an improvement method of which kernel is selected two kinds of likelihood functions for different magnitudes discharge series to deduce posterior distribution was proposed. As an example, finally, BFS was applied to the probabilistic flood forecasting for MiSai basin in south of China, It indicates that BFS can improve forecasting accuracy appropriately and the improvement method of BFS is effective. Furthermore, the improved BFS can achieve a better precision when the discharge magnitude is small.