Estimating parameter uncertainty of hydrologic models by MetropolisÍCHasting and adaptive cluster covering (ACCO) algorithms, with application to Bagmati catchment in Nepal

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Analysis of parameter uncertainty of the hydrological models is an important task and is a popular research topic. Such analysis is often based on the Bayesian estimation of the posterior parameters distributions based on the observations. We used two algorithms: (1) Random Walk Metropolis-Hasting algorithm, a popular Monte-Carlo Markov chain (MCMC) algorithm, and (2) the modification of the adaptive cluster covering (ACCO) algorithm (Solomatine, 1995, 1999) that belongs to the class of global optimization randomized search algorithms. The use of the global optimization methods as faster alternatives to MCMC algorithms was reported before (e.g., Vrugt et al., 2003), but the use of the efficient ACCO algorithms is new, and appeared to have important advantages, especially for expensive (slow) models. The convergence of the algorithm was investigated using the non-informative proposal distribution. Different likelihood functions were used to compute the posterior parameters distribution.

The study was performed using the three conceptual hydrological models on the Bagmati catchment in Nepal. Confidence intervals in the simulated steam flow by all these conceptual models are computed and compared.