**Japan Geoscience Union Meeting 2010**
(May 23-28 2010 at Makuhari, Chiba, Japan)
**©2009. Japan Geoscience Union. All Rights Reserved.**

AHW019-P07 Room:コンベンションホール Time: May 25 17:15-18:45

# Uncertainty analysis of continuous hydrologic model using sequential data assimilation

Seong Jin Noh[1*], Yasuto Tachikawa[1], Michiharu Shiiba[1]

[1]Kyoto University

Uncertainty in the predictions of science, when applied to the environment, is an issue of great current relevance in relation to the impacts of climate change, protecting against natural and man-made disasters, pollutant transport and sustainable resource management (Beven, 2009). Information of that uncertainty could be used for more credible decision making as well as better understanding of predictions.
In this study, we evaluate uncertainty of hydrologic model using sequential data assimilation using particle filter. The theory of particle filter is presented briefly. The procedure of resampling techniques to reduce the degeneracy problem is provided. The storage function model is selected and applied for the middle-sized Japanese catchment. The SF model is modified for continuous runoff prediction. Particle filter is applied for not only state update but also estimation of parameters simultaneously. Structural inadequacy of the model is analysed through the time-varying traces of parameters. The capability of particle filter for uncertainty assessment technique is illustrated using application cases and analysis.
Due to the ability to explicitly treat the various sources of uncertainty, sequential data assimilation algorithms have been used to estimate model states and parameters simultaneously. The most frequently used methods for hydrologic data assimilation are Kalman filter, variational data assimilation and particle filter (Salamon and Feyen, 2009). Particle filters, also known as sequential Monte Carlo methods (SMC), are sophisticated model estimation techniques based on simulation. The key idea is to represent posterior probability distribution functions by a set of randomly drawn samples, called particles, with associated weights (Arulampalam et al., 2002). Particle filter has the advantage of being applicable to non-linear, non-Gaussian state-space models. Furthermore, particle filter performs updating on the particle weights rather than on state variables directly.
Among various hydrologic models, the storage function model (Kimura, 1961) is one of the most commonly used models for flood runoff prediction in Asian countries due to its simple numerical procedure and proper regeneration of nonlinear characteristics of flood runoff. Many researchers have contributed to estimate and identify characteristics of storage function model parameters (Kuribayashi and Sadamichi, 1969; Aoki et al., 1979; Sugiyama et al., 1997). In this study, parameters of the SF model are treated as varying in time and analysed from the point of probabilistic approach.

Keywords: Uncertainty anaylsis, Sequential data assimilation, Particle filter,
Continuous hydrologic model, Storage function model