第Ⅱ部門　**Applicability of a Distributed Hydrological Model for Flood Prediction in Different Climatic Regions**

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1. Introduction

Number of basins which have been well observed for all hydrological responses is significantly small in the world and hence most of the basins in all climatic regions remain ungauged. Therefore, proper utilization of available limited hydrological data in different climatic regions is necessary for better prediction in ungauged basins. In this regard, testing hydrological models for different regions, inter comparison of the results and understanding the governing hydrological processors in different regions are vital.

The OHDIS-kwmss, OHyMos based distributed hydrologic model with kinematic wave method including surface-subsurface runoff was used in this study. The model is based on the one dimensional kinematic wave theory and developed by Ichikawa *et al*. 2001. The basic hydrological processors, unsaturated flow, saturated flow and overland flow is included in the model by using derived stage discharge relationship for each process (Tachikawa *et al*. 2004). In general, Japanese basins are wet and steep and the model has been well studied for many basins in Japan. However, this model is yet to be tested in other places in the world. Past studies in Japan discovered that the model is capable of predicting stream flow hydrographs with good prediction accuracy at the basin outlet as well as inside locations (Ichikawa *et al*. 2001, Tachikawa *et al*. 2004, Hunukumbura *et al*. 2008). In this study, we investigate the prediction capability of OHDIS-kwmss model for two dry basins in different countries, i.e; US (Illinois basin) and Thailand (Mae Chaem basin). Illinois basin (2400 km^2) is one of the Distributed Model Inter-comparison (DMIP) experiment basin while the Mae Chaem basin (3853 km^2) is one of the experimental basin for Prediction in Ungauged Basin (PUB). The average annual flow rate at Illinois basin and Mae Chaem basin are about 29 m^3/s and 32 m^3/s respectively.

2. Methodology

Initial investigation is carried out to identify the hydrological similarities and differences of these basins using collected hydro metrological data for different events and basin physical properties. The OHDIS-kwmss model is set up for these two basins using available data and afterwards the optimized model parameters for each basin are obtained using SCE-UA algorithm (Duan *et al.*1992). The model predicted hydrographs and consequently the observed hydrographs for different events are compared to investigate the prediction accuracy for each basin. The results are then analyzed to find out whether it is possible to predict these dry basins without changing the existing model structure or in other words, the differences of the predicted and observed hydrographs comes only from parameter differences. Finally, the optimized model

parameters for each basins and corresponding accuracies are compared with one of the modeled wet basin in Japan (Maruyama basin)

3. Preliminary results and discussion

The OHDIS-kwmss model was applied to the Illinois basin and Mae Chaem basin. The model was calibrated for each basins using SCE algorithm and obtained the optimized parameter set for each basin. The figure 1 and 2 shows the observed and model predicted hydrographs for the calibration event for Illinois basin and Mae Chaem basin respectivly.

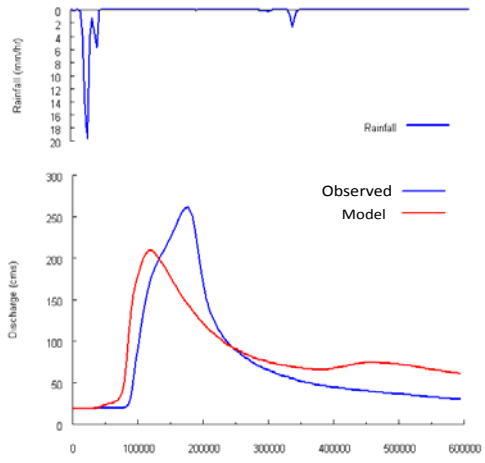

Figure-1. Observed and model predicted hydrographs of Illinois basin - Calibration

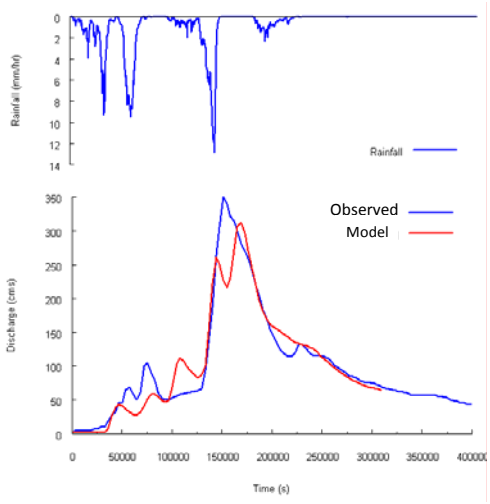

Figure-2. Observed and model predicted hydrographs of Mae Chaem basin - Calibration

When we apply the calibrated model parameters for other events it is observed that the model predictions were not good in both basins. Especially in Illinois basin, it was not possible to reproduce the hydrograph even for calibrated event itself (Fig.1). It is one indication that the present q-h relationships of the model are not possible to capture the hydrology in dry mild-slope basins. Furthermore, it is observed that the rising limb of the predicted flow hydrograph is faster than that of the observed flow while falling limb is very much slower. In the derivation of the present q-h relationship for unsaturated zone, the metric potential was neglected. That may be significant in the dry mild slope basins and therefore we are presently working on developing a new q-h relationship including the metric potential in unsaturated zone.

4. Reference:

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