Séminaire 19 Avril 2013 11h / Seminar April 19th 2013 11h

Conférencier/Lecturer: Amin Haghnegahdar, **Bryan A. Tolson** and James R. Craig
Department of Civil and Environmental Engineering, University of Waterloo.

Sujet/Subject: An Improved Framework for Watershed Discretization and model Calibration: Application to the Great Lakes Basin

Présentation/Presentation: Anglais / English

Lieu/Room: Salle des vents (Dorval)

wiki: https://wiki.cmc.ec.gc.ca/wiki/RPN_Seminars

iweb: http://web-mrb.cmc.ec.gc.ca/mrb/rpn/SEM/
web: http://collaboration.cmc.ec.gc.ca/science/rpn/SEM/index.php

Résumé/Abstract

This research has explored how model discretization decisions impact the calibration and validation performance of Environment Canada's stand-alone land surface hydrologic model MESH applied over the Great Lakes basin. The main achievements of this research can be categorized into three major outcomes. Firstly, the baseline calibration result of the model, determined by a series of calibration experiments, produces good quality hindcasts of streamflow in validation mode and this model is being used by Environment Canada scientists. Results demonstrate model performance in ungauged basins and show that our simultaneous parameter estimation strategy (for calibrating 51 model parameters) using the DDS optimization algorithm is a better approach than trying to break the calibration problem into smaller problems calibrating individual GRU (land classes) one-at-a-time. The second major outcome is that model streamflow predictive quality is compared from the current GRU definition in MESH that utilizes up to 7 GRUs (land classes) per grid cell vs. an alternative scheme in which only the dominant GRU type is used in each grid cell. Results indicate that the 7 GRU scheme outperforms the 1 GRU scheme particularly when the model is validated in time and space. At our current grid cell resolution (15 x 15 km roughly), it is believed that this finding is a result of the fact that the 7 GRU scheme does a better job in maintaining the actual heterogeneity found in nature. Thirdly, a new synthetic framework for assessing alternative discretization schemes is proposed by which we can identify the most promising discretization scheme according to our needs (performance vs. calibration time required). In particular, this framework should help to avoid using a poor scheme prior to

committing all of a studies calibration effort (modeler plus computational time). This framework has been over a pilot watershed (Nottawasaga) in Ontario for preliminary investigations and is intended to be applied to the entire Great Lakes Basin. Three various schemes (lumped, 1GRU and 7GRU) are tested over a range of calibration computational budgets (1000 to 5000). It is shown that, we can identify via the proposed synthetic framework, which discretization strategies perform best prior to actually calibrating the model against real data. As expected, as we improve model discretization the performance will improve specially in the validation mode, but this comes with much increased computational costs. It is up to the modeler to decide which discretization decision in this framework fits best his/her needs. Improved GRU definitions are also intended to be evaluated within this framework in future. Other research outcomes, including ongoing and future calibration experiments, will briefly be highlighted that are relevant to EC scientists continuing to build a hydrologic forecasting system for inflows to the Great Lakes.