Genevieve Ali and Carolyn English

From statistical inference to runoff process identification: can watershed classification do the trick?

The PUB initiative has provided a fantastic framework within which experimental findings could be compared and idiosyncratic observations put in context. Core research has aimed at relating hydrological response to boundary conditions, thus leading to the search for watershed similarity metrics in the form of hydrological signatures. In data-poor regions, however, hydrological signatures cannot be computed; dominant runoff processes (DRPs) must be inferred from the sole examination of physiographic information and the extent to which such inference can be done with sufficient confidence remains unclear. Here we explore that issue by toggling back and forth between a physiography-based DRP decision scheme and traditional statistical classification techniques. We use a dataset of several hundreds of watersheds located within the larger Lake Winnipeg drainage basin that spreads over four Canadian provinces, four US states, and nearly 1,000,000 km². The study region is a heterogeneous landscape with various types of bedrock geology and surficial deposits, near-level agricultural fields, topographic escarpments, hummocky terrain and potholes which are likely to be associated with very different DRPs. This exercise is conducted in an exploratory manner and does not aim to identify an individual physiographic property that could act as an optimal watershed similarity metric; we rather question whether specific ensembles of physiographic metrics can prove useful towards runoff process conceptualization.