# P3.4 UPDATE

## Acknowledgement

#### **Partners**

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AGM – 27 June 2017

#### **CAFFEWS: Canadian Adaptive Flood Forecasting and Early Warning System**





## M1:Hydrologic Models Identification, Calibration, Optimization [Awol, Razavi]

Common calibration approaches:

Calibration at outlet or Iterative calibration



Alternative: Multi-site simultaneous calibration with Pareto Archived Dynamically Dimensioned Search (PA-DDS) within OSTRICH

Flood

NSFRC

# M1: RESULTS OF PCSWMM – MS CALIBRATION WITH PA-DDS

For Details: See Poster of Frezer Awol



# **M1**: Hydrologic Models Identification, Calibration, **Optimization** [Awol, Razavi]



Flood NSFRC

Multi-objective **Genetic Algorithm** 

Objective functions: KGE, VE, NSE, Peak

### M1: RESULTS OF PCSWMM – MO CALIBRATION WITH GA

#### For Details: See Poster of Tara Razavi



Multi-objective (MO) vs. Single objective (SO)



# M2: Hydrologic Data Assimilation [Leach, Razavi]

SWE and Soil Moisture Assimilation in SAC-SMA using EnKF



Don Valley River Watershed, Toronto







2013 simulation results: Assimilation of streamflow to update model parameters and SM and SWE to update model states



# M3: Bayesian Forecasting System [Han, Biondi]





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x4



**Parameter uncertainty** is a large contributor to hydrologic uncertainty



# M3: Bayesian Forecasting System [Han, Biondi]



Being able to reproduce what we know:

- Hydrologic uncertainty grows with increasing lead time
- Hydrologic uncertainty increases as discharge increases
   Uncertainty bounds capture well
   actual value

For Details: See Poster of Shasha Han



# EXAMPLE 1: CAFFEWS FOR HUMBER (TRCA)





# EXAMPLE 2: CAFFEWS UPPER ASSINIBOINE (MI/MB)



FloodNet

# CAFFEWS: Hydrologic Models trca mnrf opg cvc hq mi bchfc abhfc cehq nll

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MODEL

PC/SWMM5

**CHPS SAC-SMA** 

**VS OTTOHYMO** 

**HEC-RTS.3** 

**MAC-HBV** 

**GSFLOW** 

WATFLOOD

**ADAPT-SWAT** 

**WRF-HYDRO** 

RAVEN

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Red: on-going / planned

**Blue**: in-planning