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# Multi-model Intercomparison Project on the Saskatchewan-Nelson-Churchill River Basin (Nelson-MiP project)

First meeting

8 January 2020

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# Agenda

1. Project background, scope & objectives
2. Study domain of interest
3. Gauge locations
4. Project phases and expected model outputs
5. Data exchange/data dissemination
6. Tentative timeline & Meeting Schedule
7. Contributing modeling groups/models

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# Project Background

- GWF global vision is to position Canada as a global leader in water science and provide new capability for adapting to unprecedented climate, environmental, and societal change
- Under GWF umbrella, IMPC aims to develop pan-Canadian modelling capability for the prediction and management of change at the scale of the major basins in Canada on a 7-year time frame
- Nelson-MiP and GRIP fall under Theme A5 *"Hydrologic model inter-comparison and multi-model analysis for improved prediction"* led by Tolson, co-lead: Stadnyk & Razavi
- Theme A5 is tasked to benchmark the GWF land surface hydrologic models (MESH, VIC, HYPE, etc.) against each other on multiple distinct modelling case studies (e.g. Nelson-Churchill and Great Lakes)

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# GRIP-E/GL objectives

- Develop strategies to handle cross-border issues of available data and develop unifying approaches
- Test relative performance of different models
- Identify respective strengths of models

**GRIP-E/GL focuses on forecasting applications**

**(operational i.e., shorter term)**

GRIP-E/GL is led by Bryan Tolson (U. Waterloo) and Tricia Stadnyk (U. Calgary) and coordinated by Juliane Mai (U. Waterloo)

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# GRIP-E/GL achievements

- In years 1-3, 18 models from 14 institutions have participated to GRIP-E over Lake Erie watershed (incl. Lake St. Clair)
- All models in GRIP-E used different geophysical data but a standard meteorological forcing dataset (RDRS: 15km – hourly – 2010-2014)
- Models in GRIP-E were calibrated (global and/or on-site) for multiple sub-watersheds against measured streamflow only
- Going forward, GRIP-GL is also standardizing the geophysical data for model setup, and expanding both the spatial and temporal coverage of the modelling efforts

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# Nelson-MIP Objectives (Y4-7)

**Main goal: Evaluate internal model processes and generate an ensemble of GWF land surface hydrological models for the Nelson River basin**

i. compare participating hydrologic and land surface models with respect to their performance in reproducing long-term runoff and various hydrologic signatures;

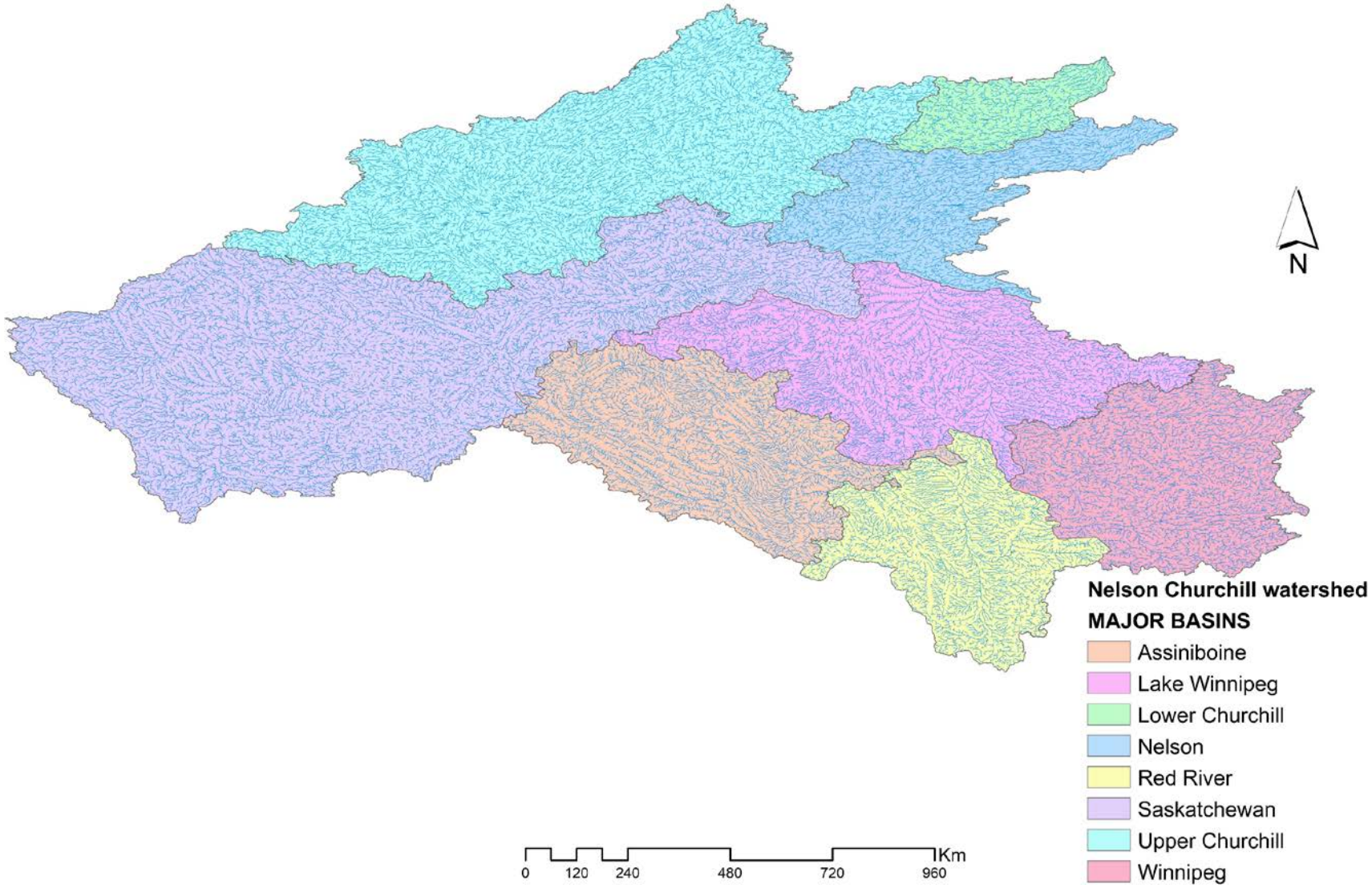
ii. understand the drivers of the differences among models from an internal process perspective;

iii. assess the realism of different algorithms in simulating the same processes;

iv. assess the reliability of the models for the prediction of key hydrologic processes and streamflow under changing climate conditions;

v. develop robust ensemble averaging methods to reduce the range of uncertainties in streamflow projection under changing climate conditions.

# Study Domain (decision to be made on the research scales)




- Modelers are NOT required to simulate processes for all basins.

- BUT **modelers** should **decide on the scale** they are contributing to **and inform participants** (through project coordination) of chosen domain

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# Gauges Of Interest

- Modelers should suggest per basin the gauge locations they are interested in for model calibration and validation.

- UC-HAL will compile the suggestions and prepare a standardized list of calibration and validation gauge locations, and disseminate the related streamflow data per basin for our next meeting.

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# Project phases and expected model outputs

- **Phase 0**: Current model status/baseline (run with user-defined parameter sets)
- **Phase 1**: Recalibrated model run at unregulated (headwater) gauges
- **Phase 2**: Recalibrated model run at regulated gauges
- **Phase 3**: Ensemble modeling of climate change impacts using CMIP6 to drive the models developed in Phase 1 and/or Phase 2.

**OUTPUT**: All states and flux at a daily time step to gain a better understanding of the modelled processes. To conserve storage space, some output may be designated as spatial averages per drainage basins (to be determined later).

**Modelers are NOT required to participate in all phases,**

**but we need to know who is doing what and where!**

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# Data exchange/data dissemination

- UC-HAL will provide a private GitHub for data exchange/data transfer for this project.

**Other ideas for data exchange/data transfer? Do let us know.**

- All modelers will have access to the GitHub repository and thus can access/download inputs and other modelers' outputs.
- **If you are NOT willing to share your model outputs and model configuration open source with others?** Please let us know before submitting any data. Accommodations can be made, but the preference is that all models and data are shared.

- Webpage for the project as results come out.
- Conferences and joint publications are encouraged and will be initiated by project coordination

You can publish your own model outputs anytime. When **using data from other modelers, we require you to get their written consent** and inform the project coordination prior to any form of publication.

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# Tentative timelines (open to discussion)

**Total project duration: 2020 - 2023**

## Submission of model outputs and model configuration

- **Phase 0**: submission of model outputs by December 2020
- **Phase 1**: submission of model outputs by December 2020
- **Phase 2**: submission of model outputs by December 2021
- **Phase 3**: submission of model outputs by December 2022

## Monthly online meeting schedule (1-hour long)

- **Goal**: Report on status, discuss challenges among group, and provide support as needed.
- Webex or zoom.us meeting **every second Wednesday of the month starting at 10:00 am MST** (suggestion). Connection link, meeting agenda and reminder will be sent via email a least a weak before the next meeting.

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# Participating modeling groups and models

| MODELS | Watersheds/Scale | Institutions | Contact persons |
|---|---|---|---|
| **HYPE** | Nelson Churchill | UC-HAL | Tricia Stadnyk<br>tricia.stadnyk@ucalgary.ca<br>Hervé Awoye<br>oyemonbade.awoye@ucalgary.ca<br>Ajay Bajracharya<br>ajay.bajracharya@ucalgary.ca |
| **SWAT-GIW** | Upper Assiniboine | Water Security Agency | Ameer Muhammad<br>Ameer.Muhammad@wsask.ca<br>Curtis Hallborg<br>curtis.hallborg@wsask.ca |
| **SWAT-GWF** | To be determined | University of Alberta | Monireh Faramarzi<br>faramarz@ualberta.ca<br>Pouya Khalili<br>khalili@ualberta.ca<br>Badrul Masud<br>masud@ualberta.ca |
| **VIC** | Lower Nelson River | UNBC | Stephen Dery<br>stephen.dery@unbc.ca<br>Rajtantra Lilhare<br>Rajtantra.lilhare@unbc.ca |

# Participating modeling groups and models

| MODELS | Watersheds/Scale | Institutions | Contact persons |
|---|---|---|---|
| HEC-HMS | Lower Nelson & Red rivers | Strategic Consulting | Scott Pokorny<br>umpokors@myumanitoba.ca<br>Henry David (Hank) Venema<br>hank@strategiccc.ca |
| SUMMA | Nelson Churchill | University of Saskatchewan | Martyn Clark<br>martyn.clark@usask.ca<br>Wouter Knoben<br>wmk934@usask.ca<br>Shervan Gharari<br>shervan.gharari@usask.ca |
| WATFLOOD-MH | To be determined | Manitoba Hydro | Kristina Koenig<br>kkoenig@hydro.mb.ca<br>Shane Wruth<br>swruth@hydro.mb.ca<br>Phillip Slota<br>pslota@hydro.mb.ca<br>Mark Gervais<br>mgervais@hydro.mb.ca<br>Kevin Sagan<br>ksagan@hydro.mb.ca |

# Participating modeling groups and models

| MODELS | Watersheds/Scale | Institutions | Contact persons |
|---|---|---|---|
| **RAVEN** | To be determined | University of Waterloo | James Craig jrcraig@uwaterloo.ca |
| **HBV-EC** | To be determined | Manitoba Infrastructure | Fisaha Unduche fisaha.unduche@gov.mb.ca |
| **WATFLOOD-MI** | To be determined | Manitoba Infrastructure | Fisaha Unduche fisaha.unduche@gov.mb.ca |
| **Noah-MP** | Assiniboine & Red rivers | Western University | Mohammad Reza Najafi mnajafi7@uwo.ca |
| **MESH** | Saskatchewan river | ECCC | Bruce Davison bruce.davison@canada.ca |
| **SWAT-RRB** | Red River Basin | University of Manitoba | Masoud Asadzadeh Masoud.Asadzadeh@umanitoba.ca |

**All groups need an alternate - Please specify someone and send us your alternate(s) email address(es)!**

# Collaborators

| Institutions | Contact persons |
|---|---|
| **ECCC** | Frank Seglenieks<br>frank.seglenieks@canada.ca<br>Daniel Princz<br>daniel.princz@canada.ca<br>André Guy Temgoua<br>andreguy.temgoua@canada.ca |
| **University of Waterloo** | Bryan Tolson<br>btolson@uwaterloo.ca<br>Juliane Mai<br>juliane.mai@uwaterloo.ca |
| **University of Saskatchewan** | Mohamed Elshamy<br>mohamed.elshamy@usask.ca<br>Saman Razavi<br>saman.razavi@usask.ca |

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# Additional Participants?

- It’s not too late to join!
- Know of anyone else that may be interested? Please feel free to invite additional participants to the MIP. Pass on the project coordination team information

Hervé Awoye - oyemonbade.awoye@ucalgary.ca

Tricia Stadnyk - tricia.stadnyk@ucalgary.ca

# Deliverables (due by January 22 2020)

- Specify your alternate contact
- Geophysical inputs template to be filled
- List of gauges for your current model setup
- Gauges you are willing to contributed to Nelson-MiP calibration and validation
- Time periods of interest (calibration vs validation)
- Meteorological forcing data suggestion

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# Preparation for February 12, 2020

- Would you be willing to setup your model with standardized geophysical data?
- What process validation data do you recommend?

Discussion of the gauges selection (calibration/validation), time periods (calibration/validation) and forcing data