Nelson-MiP UW Contribution

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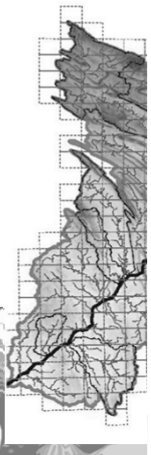
the Raven framework

- Flexible ***Hydrological modelling framework*** designed for
  - **Research**:
    - Investigating impacts of model choices on model skill
    - Sub-model hypothesis testing
    - Development and evaluation of new upscaled process representations
  - **Operational Use**:
    - *Flexible/Nimble* means of simulating flow and transport in both simple and complex watershed systems
    - Highly optimized open-source code; readily scripted
    - Distributed modelling with reservoirs, lakes, water management
    - Trying to leverage other ongoing research to participate in Nelson-MIPs intercomparison



Craig, J.R., et al., *Flexible watershed simulation with the Raven hydrological modelling framework*, Environmental Modelling and Software, 129, 104728, doi:10.1016/j.envsoft.2020.104728, July 2020

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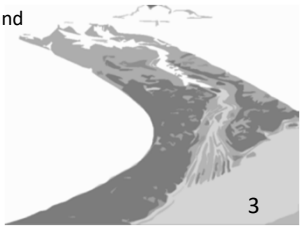
Nelson-MIPs: Three Raven Configurations

- **Model 1: PDM variants**
  - Contact: Mahkameh Taheri, PhD Candidate (UW)
  - Variants of:
    - HYPR model of Ahmed et al. (2020) [Shown to perform well in prairies]
    - Fill-and-spill upscaling model of Taheri et al (in prep)
      - Generalization of PDM model (Moore, 1986) to handle contributing area and fill-and-spill cascades
  - Focus on 3-4 prairie basins
- **Model 2: Structurally optimized model - lumped**
- **Model 3: Structurally optimized model - distributed**
  - Contact: Juliane Mai, Research Asst. Prof (UW)
  - Variants of HMETS with automatically optimized structure and parameters using DDS
  - Deployed in lumped mode on 73 basins
  - Distributed model just on Bow River basin
- All models:
  - Relying on experimentation with model structure as part of calibration process



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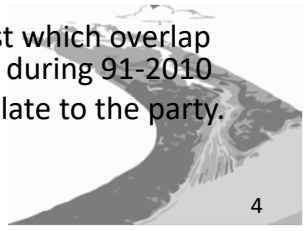
Model configuration

- HRUs discretized using elevation bands and land cover
  - Soil data unused
- Distributed routing to be handled using data product of Han et al. (2020) [CWRJ]
- Daily time step
- Model 1 efforts to focus on select prairie basins
  - Assiniboine @ Kamsack (05MD004)
  - Assiniboine near Russell (05ME001)
  - ??
- Model 2 deployed at all gauges of interest which overlap PAVICs dataset (73 stations with >5 years during 91-2010
- Likely a lot of decisions remaining – a bit late to the party.



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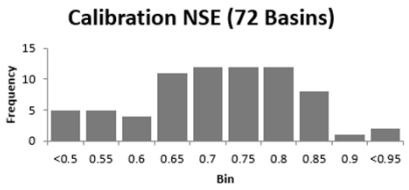
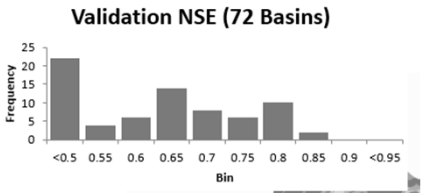
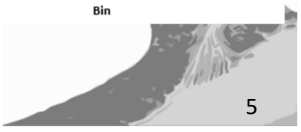
Preliminary Results

- Model 2: Structurally optimized model
- 'out-of-the-box'
  - Fully automated, no fine tuning
- Calibration ('91-'20)
- Validation ('70-'90)
- Using NRCan forcing data (not yet WFDEI-GEM-CaPA)







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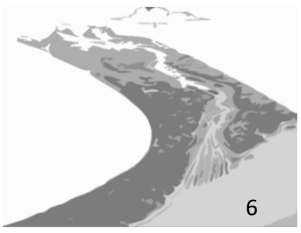
Questions?



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