



UNIVERSITY OF SASKATCHEWAN

Global Water Futures

GWF.USASK.CA



Core Modelling Team

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GWF Core Modelling Inception Strategy

-is to establish the core modelling team that is needed to deliver the “new modeling tools” and “new monitoring systems” for Canada and the cold regions of the world that were identified as key programme deliverables. These tools will support:
 - (A) Improved disaster warning. Currently, we lack the scientific knowledge, monitoring and modeling technologies, and national forecasting capacity to predict the risk and severity of potentially catastrophic events in Canada. These knowledge gaps and technology barriers have resulted in significant loss of life and property in recent years.
 - (B) Predicting water futures. The world lacks water data on a scale to make informed decisions, and we cannot forecast future climate impacts without better models to assess changes in our human/natural land and water systems.



Hydrological & Water Quality Forecasting

- Real-time forecasting of streamflow, lake levels, snowpack, soil moisture, drought and flood, water quality episodes at multiple scales across Canada. It is well understood that there are many issues in forecasting resulting from sparse stream gauge and precipitation station networks, poor DEMs, inadequate inclusion of cold regions processes in most models.
- Many researchers are acutely aware of the difficulty in characterizing e.g. variable contributing area in the prairies, arctic and Canadian Shield and river ice, as well as opportunities to assimilate snowpack, water levels, water storage, streamflow, into models for real time forecasting.
- 10 Staff



Climate and Diagnostic Hydrological & Water Quality Modeling

- Purpose – new high resolution atmospheric modelling of water futures will provide a) a new paradigm for modelling climate using dynamical downscaling, including for the first time realistic convection-explicit future precipitation, and b) a new era of coupled hydrological-atmospheric modelling of cold region processes in complex terrain. The hydrology/water quality modelling will deliver in the first 3 years a multi-model framework that will enable unified pan-Canadian modelling to build on existing regional efforts and tools.
- Applications will include water budget estimation, ungauged basin prediction, water quality, streamflow/ snowpack/ glacier/ permafrost/ soil-moisture/ surface-storage/ groundwater-storage synthesis for previous century, examination of hydrological, lakes and water quality sensitivity to climate and land use changes and streamflow/ snowpack/ glacier/ permafrost/ soil-moisture/ surface-storage/ groundwater-storage synthesis for future climates. This will be followed by a new state-of-the-art modelling system built on advanced computer systems, data assimilation and user-focussed cloud-based outputs.
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Water Resources Modeling

- Purpose - We envision the emergence of a new paradigm of water resource systems modelling, which integrates water quality and quantity, addresses environmental flow needs, and economic valuations and trade-offs. We also see a new era of stakeholder engagement whereby public participation in water resources modeling is an iterative, collaborative, two-way exchange, and scientific knowledge is co-produced. There is a clear need to address the human dimensions that will determine water futures by:
 - (1) integrating human behaviour, economic valuation, and policy decisions into water resource models,
 - (2) building adaptive governance models to deal with problems of uncertainty,
 - (3) developing and testing economic tools and incentives for managing water futures,
 - (4) conducting basic social science research into the social processes and learning embedded in stakeholder engagement, and
 - (5) building an indicator system that enables benchmarking performance for governance deficiencies, policy transfer, and social learning.

3 staff



Status

Status of Models - September 2017																
	Hydrology Models							Atmospheric Models				NON-Point Water Quality			Lake and River	
	CHRM	MESH	GEM-Hydro	VIC	HYPE	CHM	other	WRF	GEM	Statistical	Other	Sparrow	MAGIC	HYPE	WASP	?
Saint John									x							
Great Lakes		x	x						x			x				
SK-Nelson	x (sub-basin)	x	x		x	x (part)		x	x			x				
Mackenzie	x (sub-basin)	x					river	x	x							
Yukon	x (sub-basin)	x						x	x							
Fraser								x	x							
Columbia								x	x							

Status of Models - September 2020																
	Hydrology Models							Atmospheric Models				NON-Point Water Quality			Lake and River	
	CHRM	MESH	GEM-Hydro	VIC	HYPE	CHM	other	WRF	GEM	Statistical	Other	Sparrow	MAGIC	HYPE	WASP	?
Saint John	x (sub-basin)	x	x	x			river	x	x	x		x	x	x	x	
Great Lakes	x (sub-basin)	x	x	x	x		river	x	x	x		x	x	x		
SK-Nelson	x (sub-basin)	x	x	x	x	x	river	x	x	x		x	x	x	x	
Mackenzie	x (sub-basin)	x	x	x	x	x	river	x	x	x		x	x	x	x	
Yukon	x (sub-basin)	x	x	x		x	river	x	x	x		x	x	x	x	
Fraser	x (sub-basin)	x	x	x				x	x	x		x	x	x	x	
Columbia	x (sub-basin)	x	x	x				x	x	x		x	x	x		