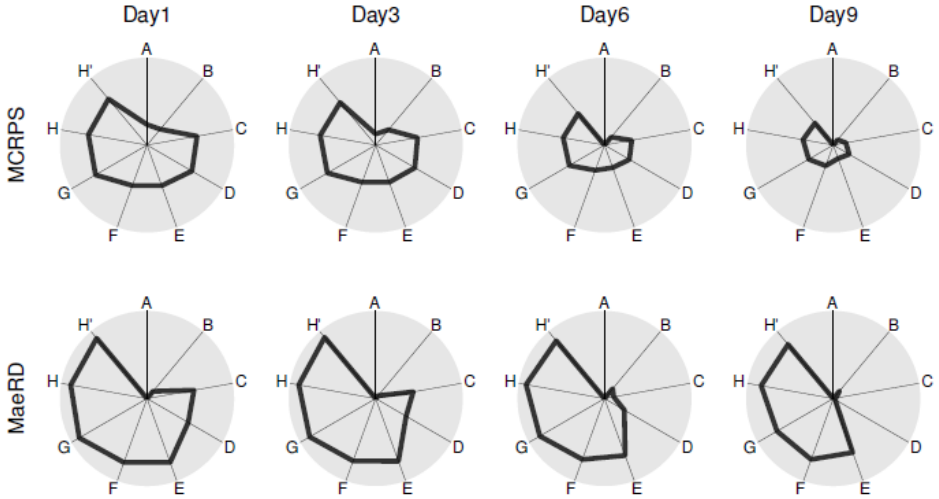
Water level forecasting and flood warning

Implementing an hourly H-EPS

A. Thiboult
Toronto – September 19, 2016

Hydrological Processor

- Back to project 2-2



- 9 systems
  - MEPS
  - EnKF
  - Multimodel
- Accuracy / reliability
- But daily time step…

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Objectives

- Develop a hydrological processor
  - Hourly time step for coupling with a hydraulic model
  - Identification of suitable structures
  - Modification of original structures
  - Implementation of a data assimilation technique (EnKF)

- Get similar performance as for the daily time step

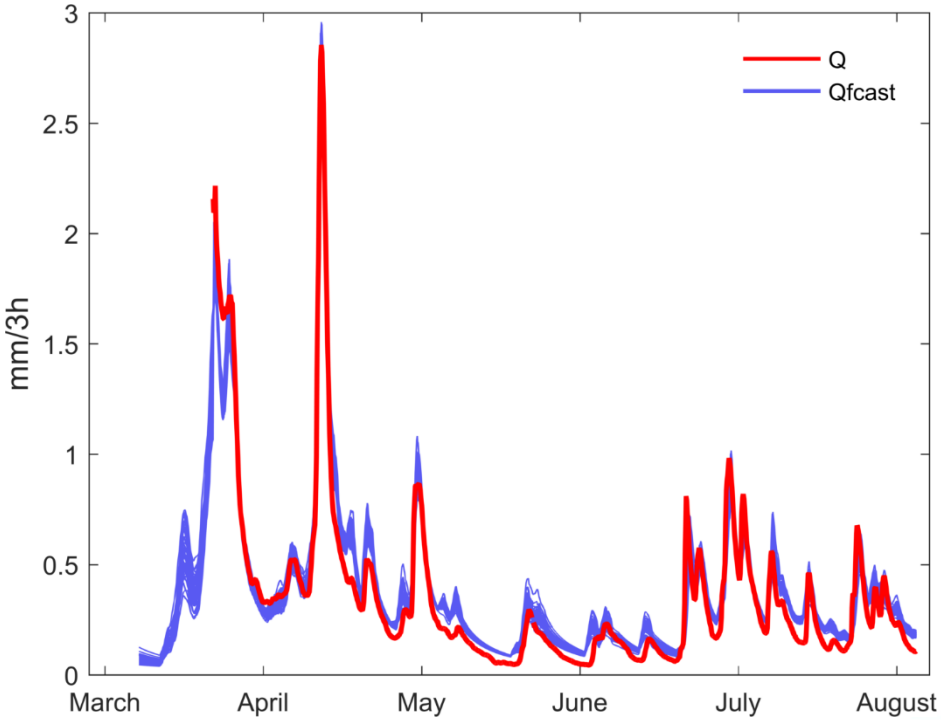
Hydrological Multimodel

Model	Model acronym	No param	No reserv.	Derived from
M01	BUCK	6	3	BUCKET (Thorthwaite and Mather, 1955)
M02	CEQU	9	2	CEQUEAU (Girard et al., 1972)
M03	CREC	6	3	CREC (Cormary and Guilbot, 1973)
M04	GARD	6	3	GARDENIA (Thiery, 1982)
M05	GR4J	4	3	GR4J (Perrin et al., 2003)
M06	HBV0	9	3	HBV (Bergström et al., 1973)
M07	HYMO	6	5	HYMOD (Wagener et al., 2001)
M08	IHAC	7	3	IHACRES (Jakeman et al., 1990)
M09	MART	7	4	MARTINE (Mazenc et al., 1984)
M10	MOHY	7	3	MOHYSE (Fortin et al., 2006)

Model	Model acronym	No param	No reserv.	Derived from
M11	MORD	6	4	MORDOR (Garçon, 1999)
M12	NAM0	10	7	NAM (Nielsen et al., 1973)
M13	PDM0	8	4	PDM (Moore et al., 1981)
M14	SACR	9	5	SACRAMENTO (Burnash et al., 1973)
M15	SIMH	8	4	SIMHYD (Chiew et al., 2002)
M16	SMAR	8	4	SMAR (O'Connell et al., 1981)
M17	TANK	7	4	TANK (Sugarawa, 1979)
M18	TOPM	7	4	TOPMODEL (Beven and Kirkby, 1979)
M19	WAGE	8	3	WAGENINGEN (Warmerdam et al., 1997)
M20	XINA	8	5	XINANJIANG (Zhao et al., 1980)

Preliminary Results

- 3 hours ahead
- Single model
- EnKF
- Perfect forcing



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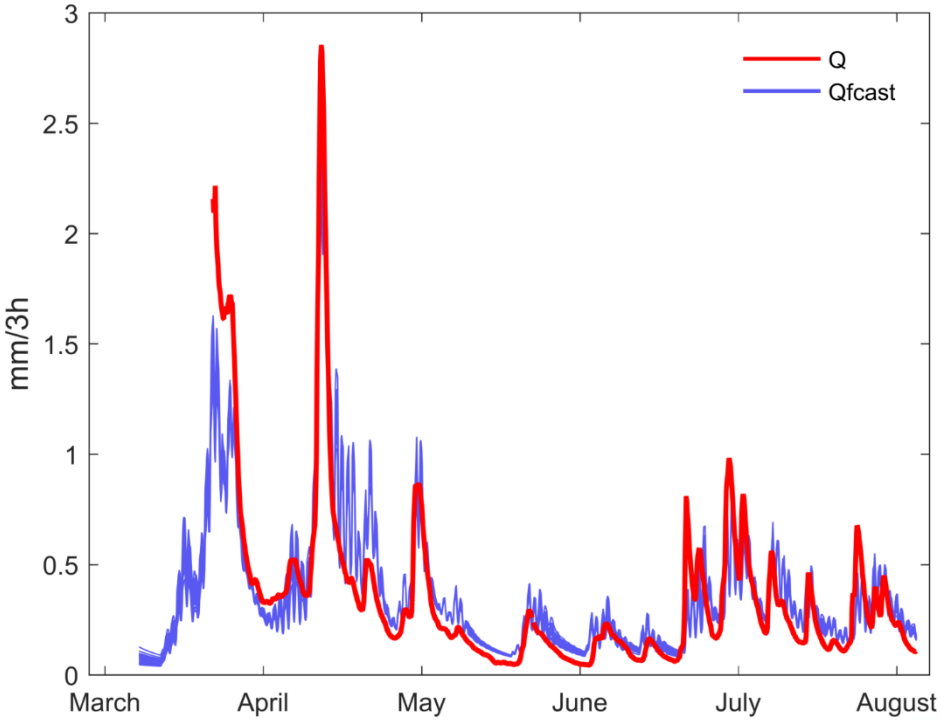
Preliminary Results

- 72 hours ahead
- Single model
- EnKF
- Perfect forcing



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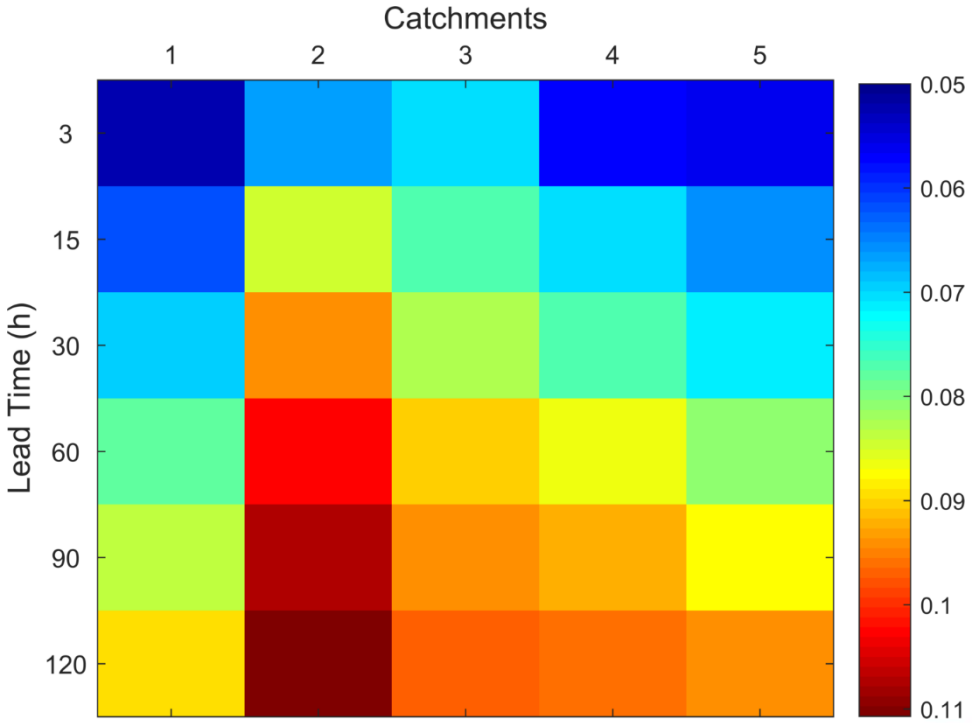
Preliminary results

MCRPS



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Ongoing work / Perspectives

- Conversion of the 19 models remaining
- Evaluation of performance
- Selection of a subset of the models ?

Water level forecasting and flood warning

Implementing a river model

M.A. Bessar
Toronto – September 19, 2016

Objectives

Hydraulic model with reliable water level forecasts

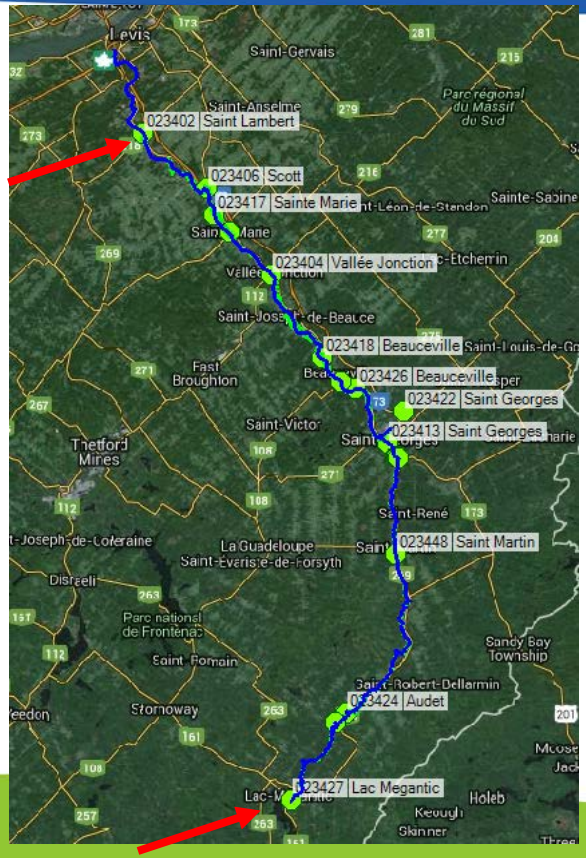
Explore the various sources of uncertainty

Introduce data assimilation techniques

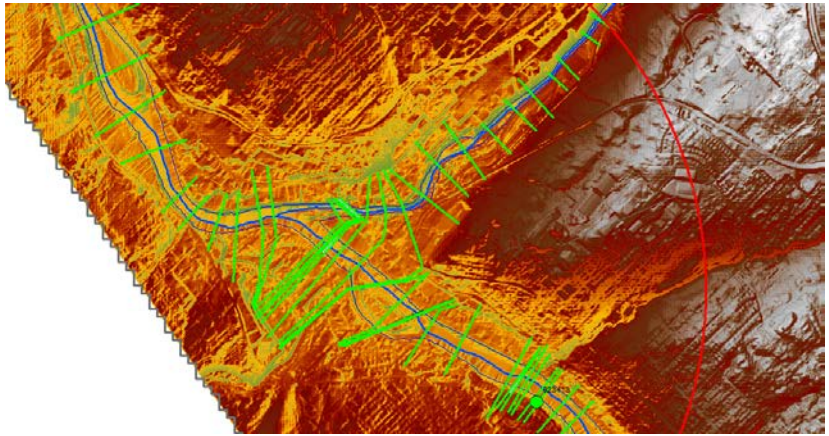
Ensemble forecasting

Case Study: Chaudière River

Chaudière River model



- About 160 Km extending from DS Megantic Lake to ~20 Km US Chaudière Falls



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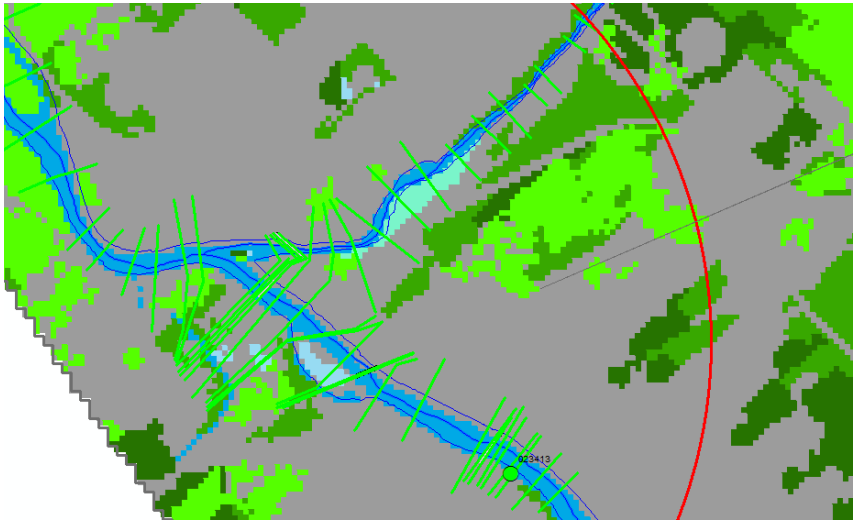
Chaudière River model

- Detailed Land use Data

Agricultural
Urban
Aquatic
Cuts and regenerations
sparse forest
dense forest
Wet area
bare soil and moorland



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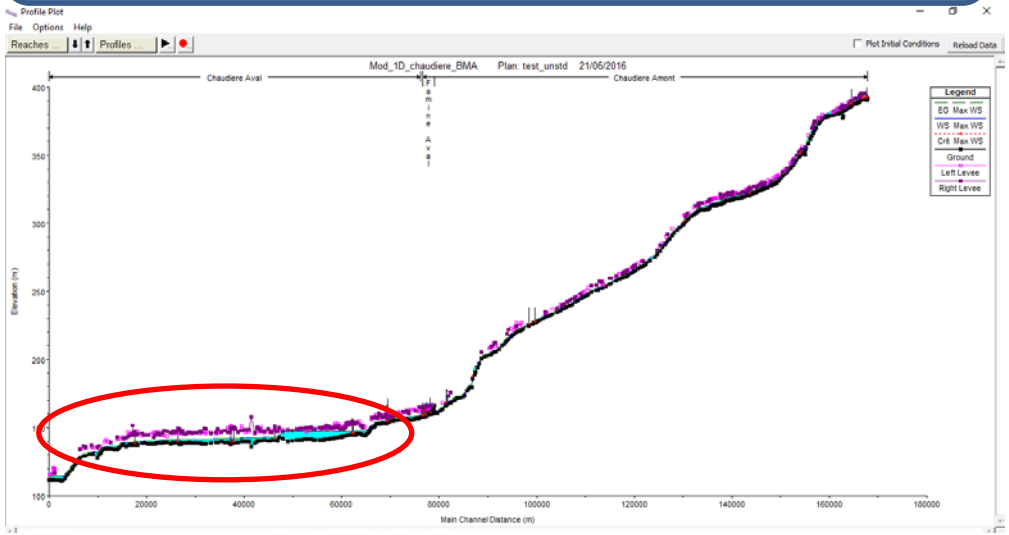
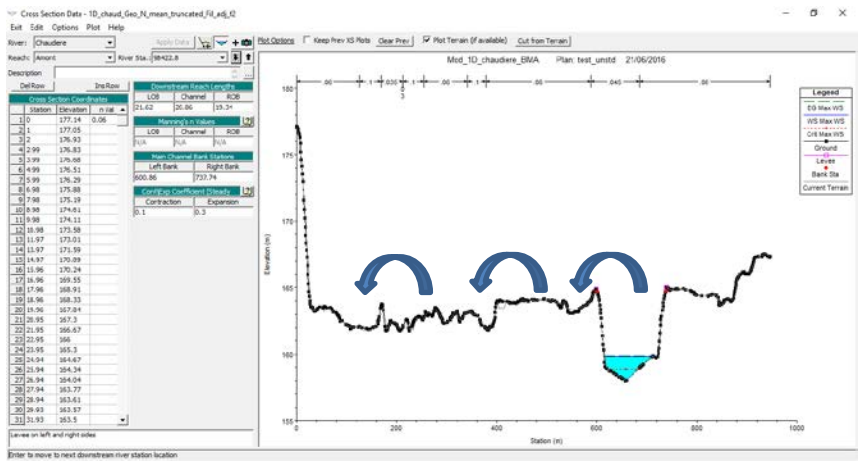
River model Analysis

Higher inundations risk DS the famine river confluence



Local Complex flow



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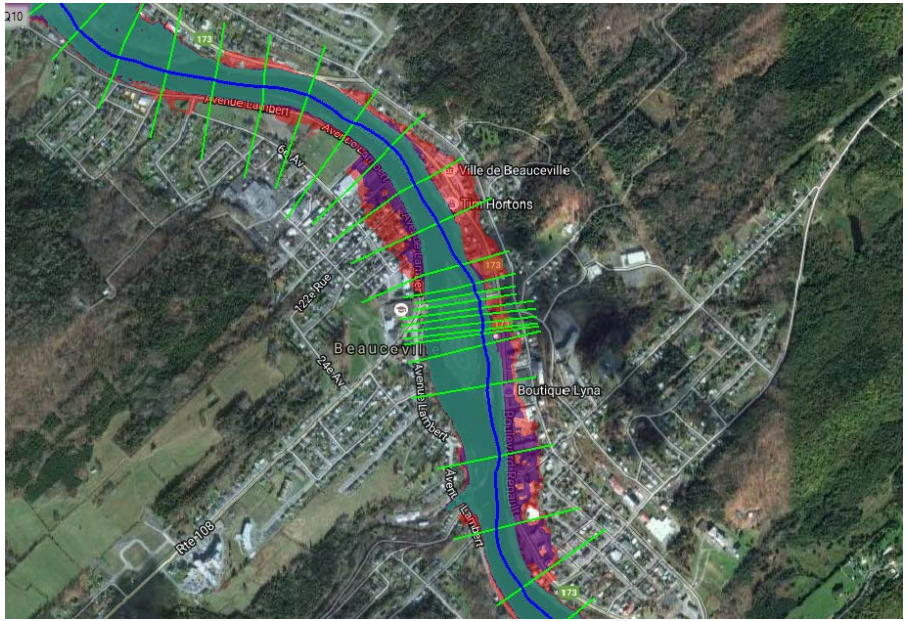
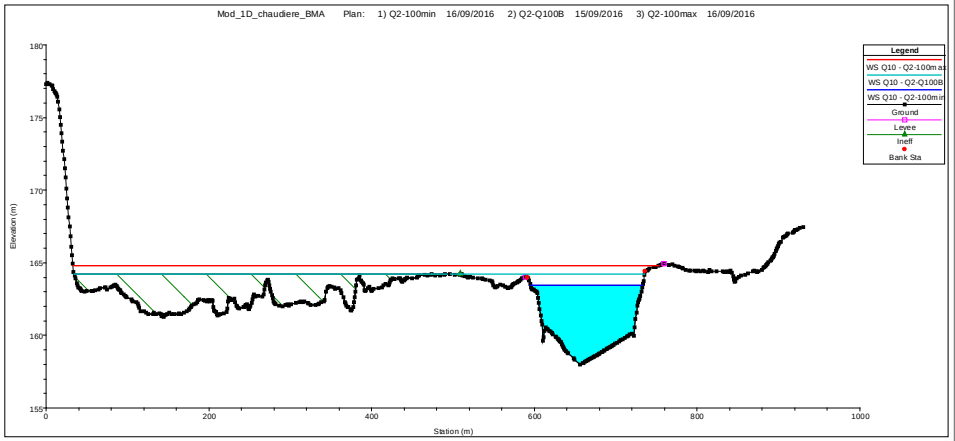
Preliminary results

Q10 floodmaps vs Manning values



WL vs Manning values



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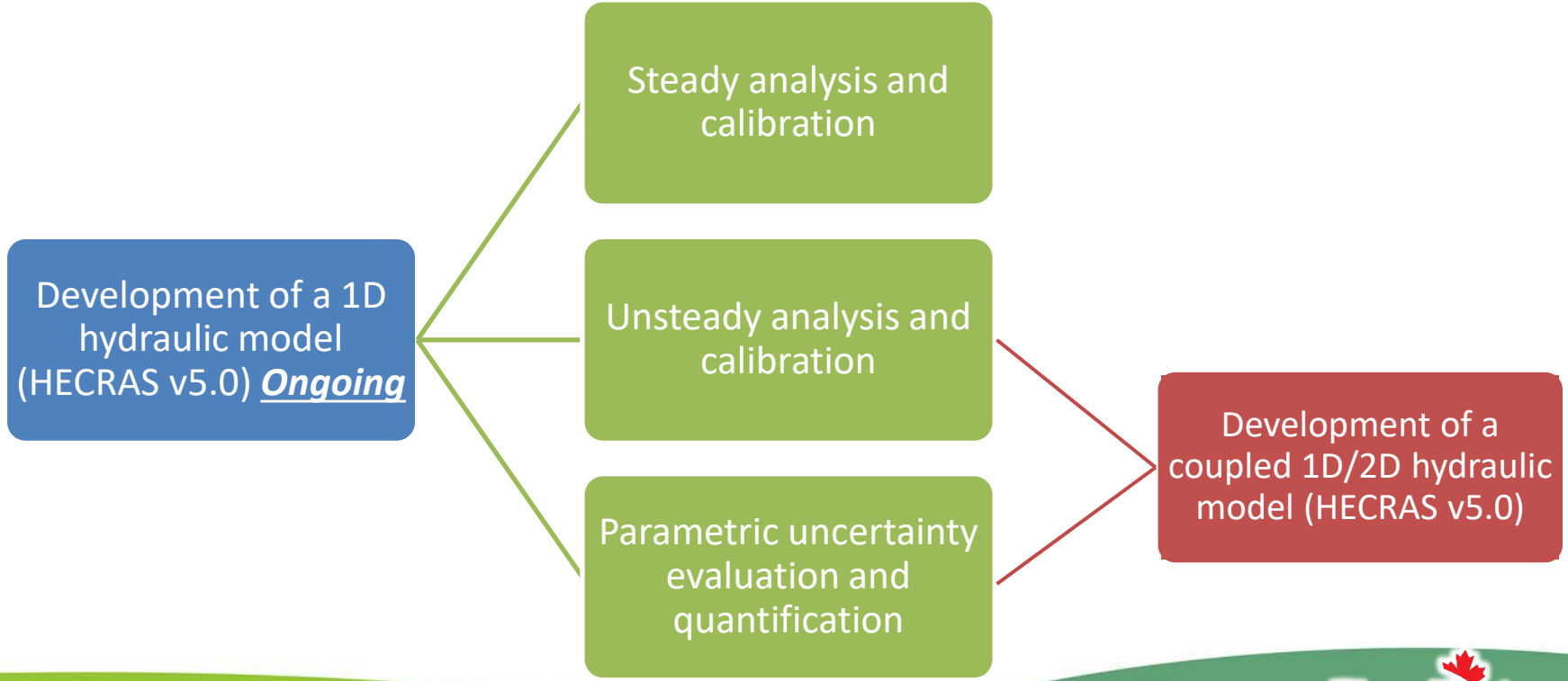
Next steps 1/2



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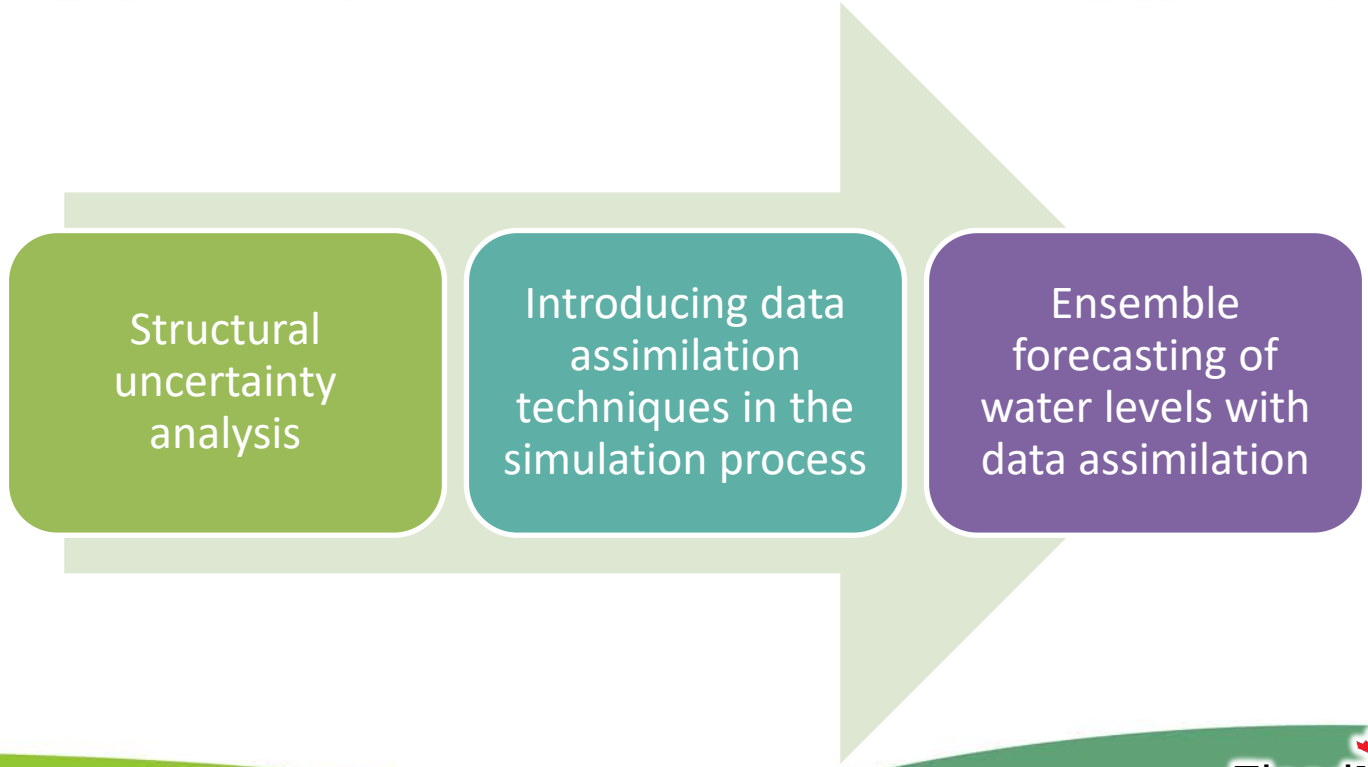
Next steps 2/2



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