



IMPC

Water quality and river ice (A3 and A4)

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Global Institute for
Water Security

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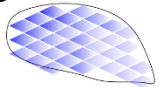


Outline

- MESH – RBM coupling
 - ice breakup timing
- MESH – RIVICE coupling
 - ice-jam flood forecasting
 - with Nadia Kovachis, Alberta Env. & Parks
 - with Ali Khan, Water Resources Management Division, Gov't Newfoundland & Labrador,

METEOROLOGICAL FORCING DATA

1 Precipitation



2 Air temperature

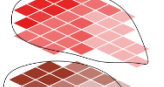


Max.

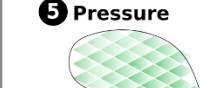


Min.

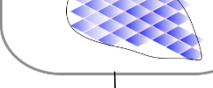
3 Wind speed



4 Incoming solar radiation



Long wave



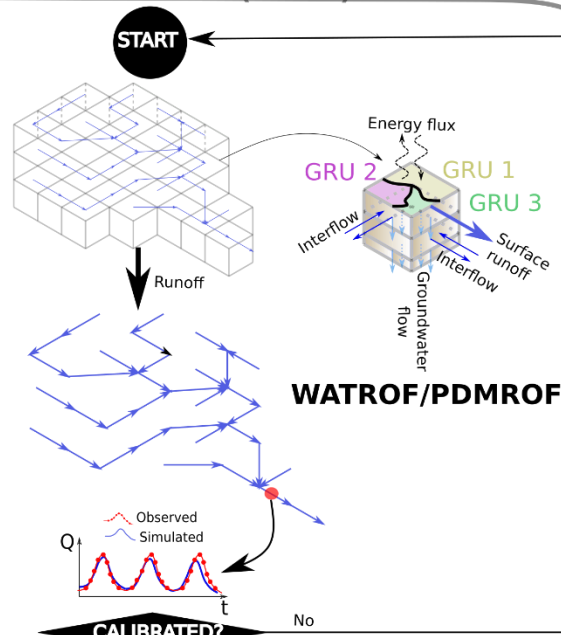
Short wave



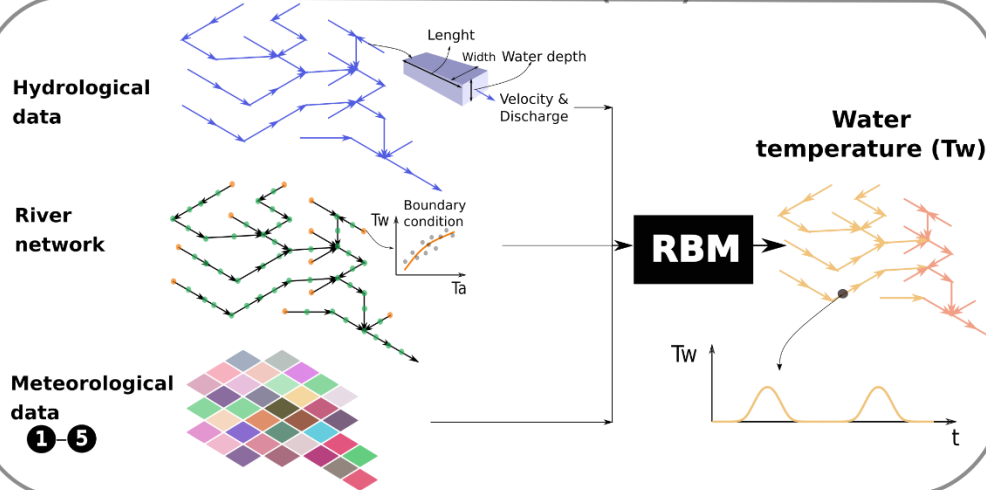
5 Pressure



6 Specific humidity

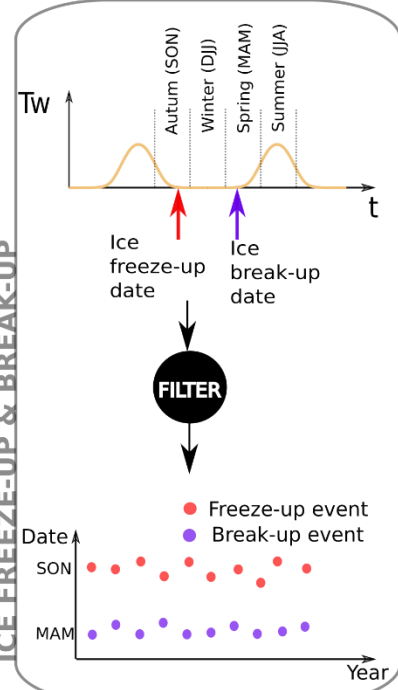
LAND-SURFACE
SCHEME (CLASS)FLOW ROUTING
(WATFLOOD)Hydrological data &
river network

WATER TEMPERATURE MODELLING (RBM)



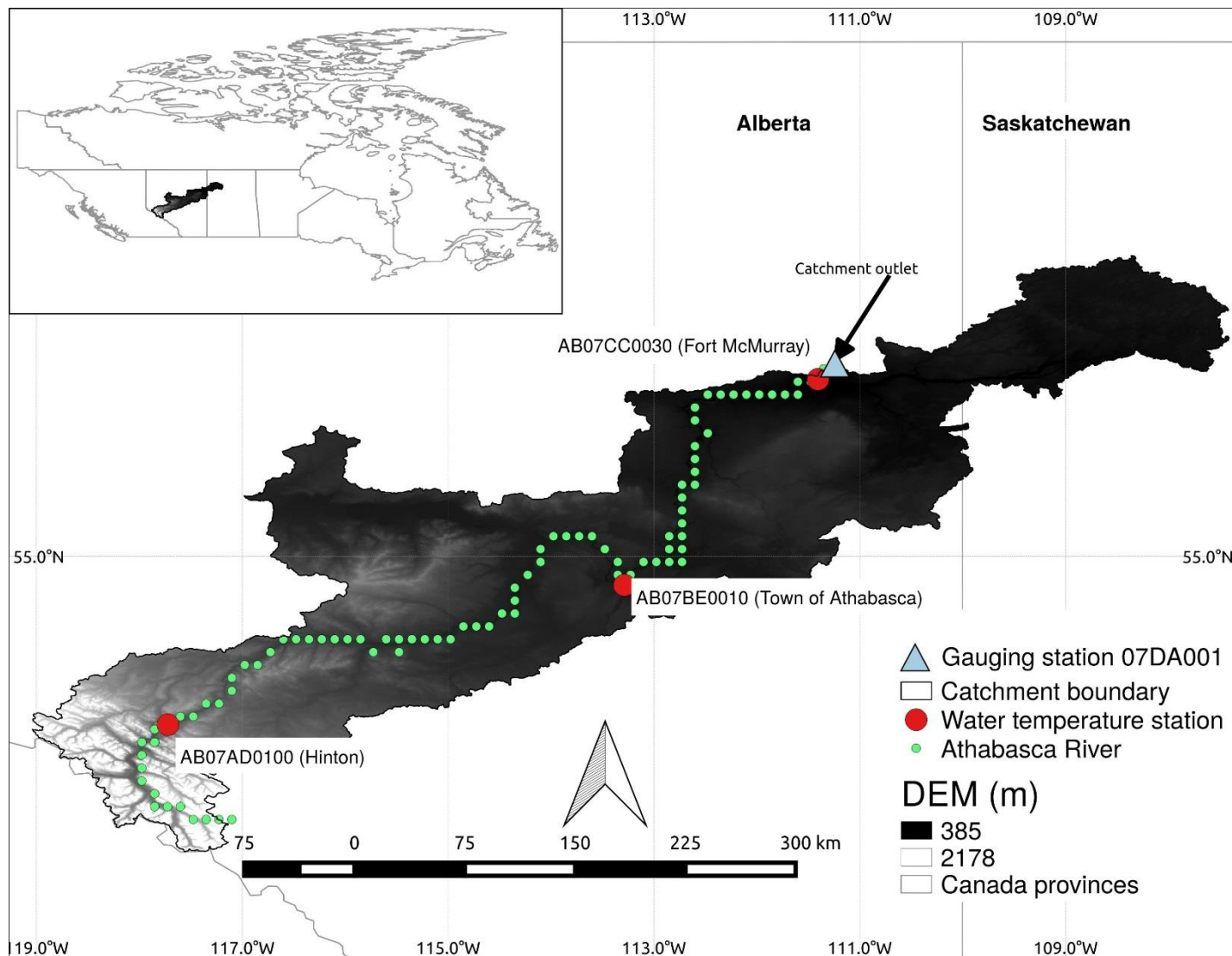
Tw time series

ICE FREEZE-UP & BREAK-UP

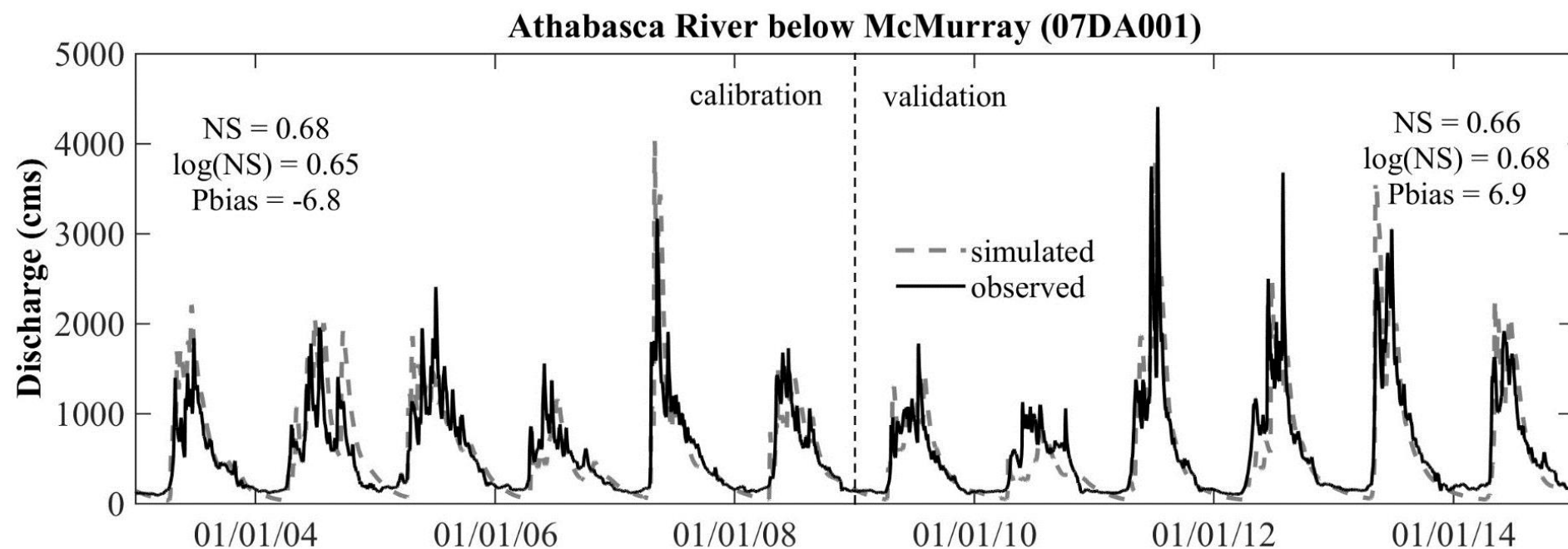




Athabasca River basin

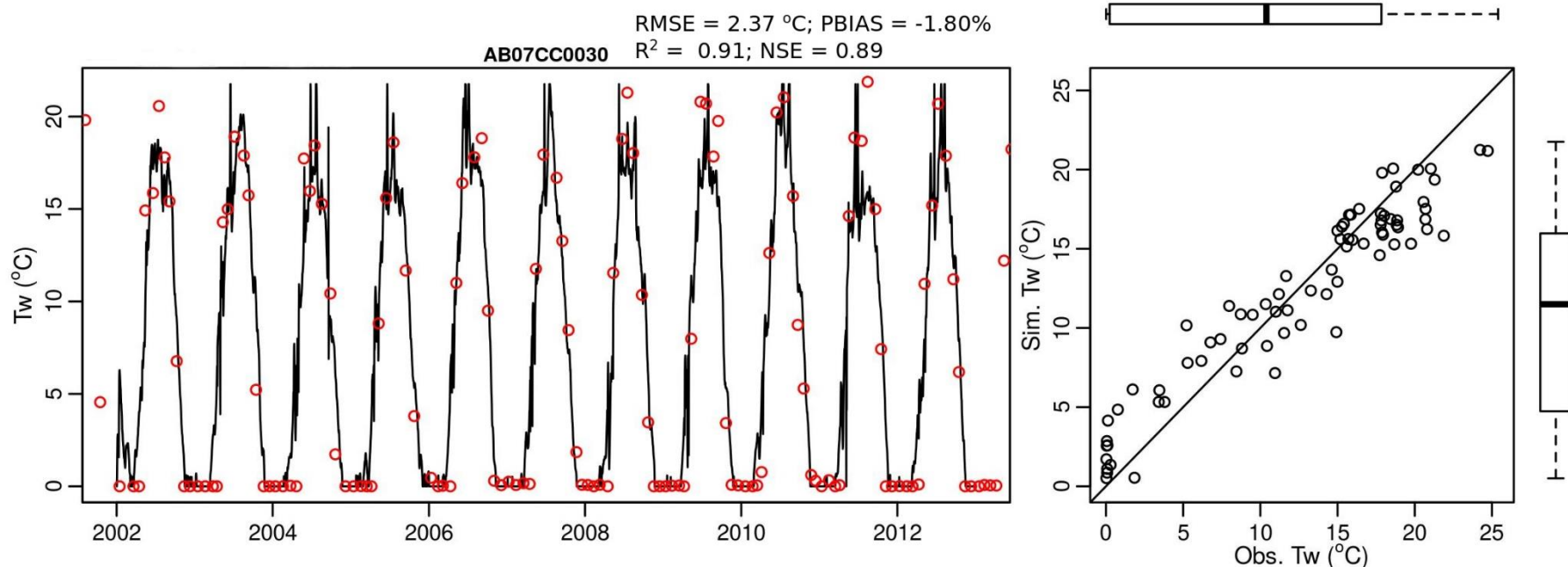


MESH simulations



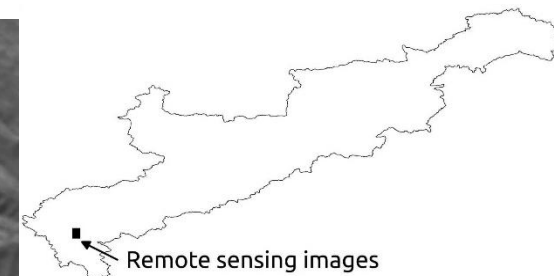
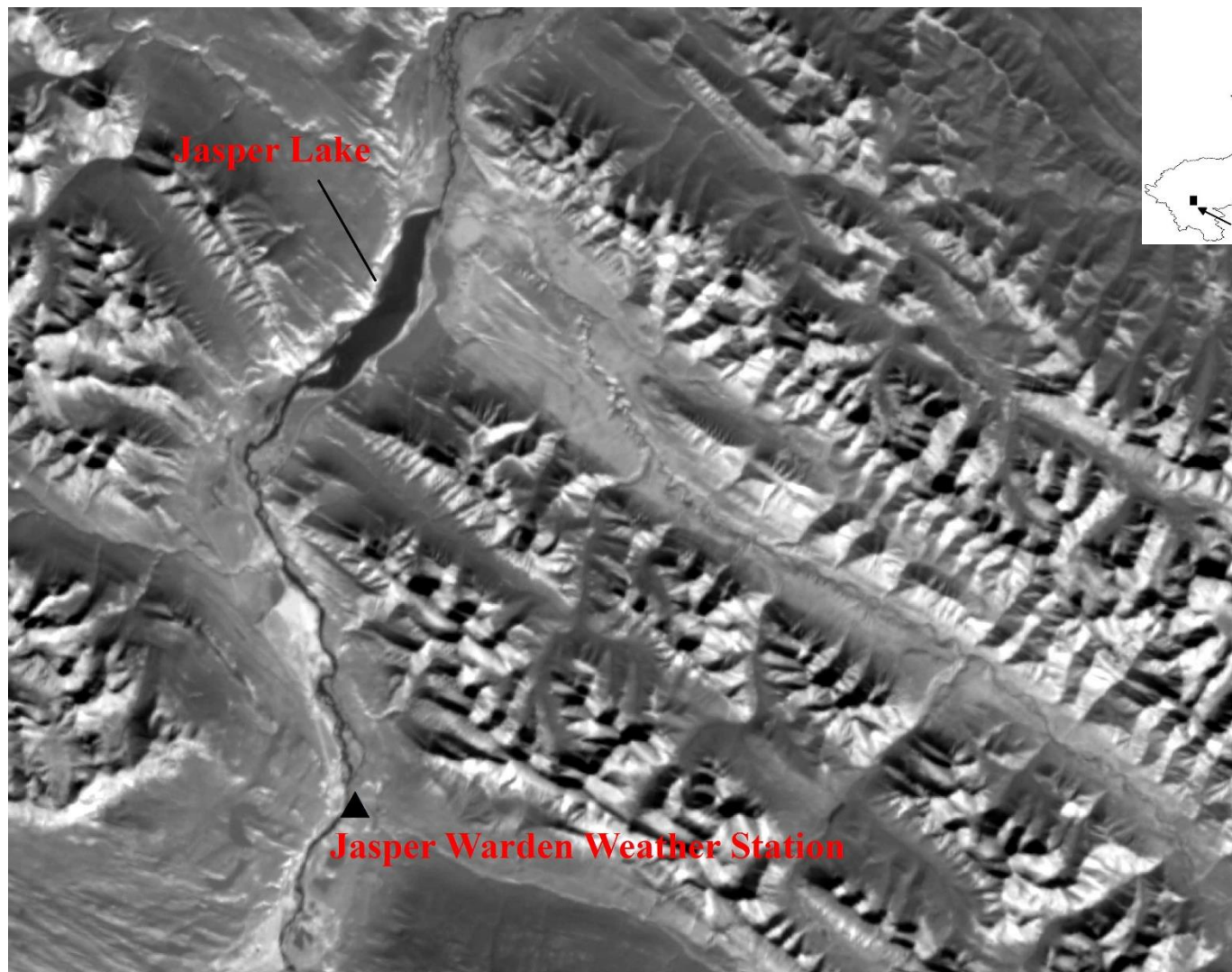


Water temperatures at Fort McMurray



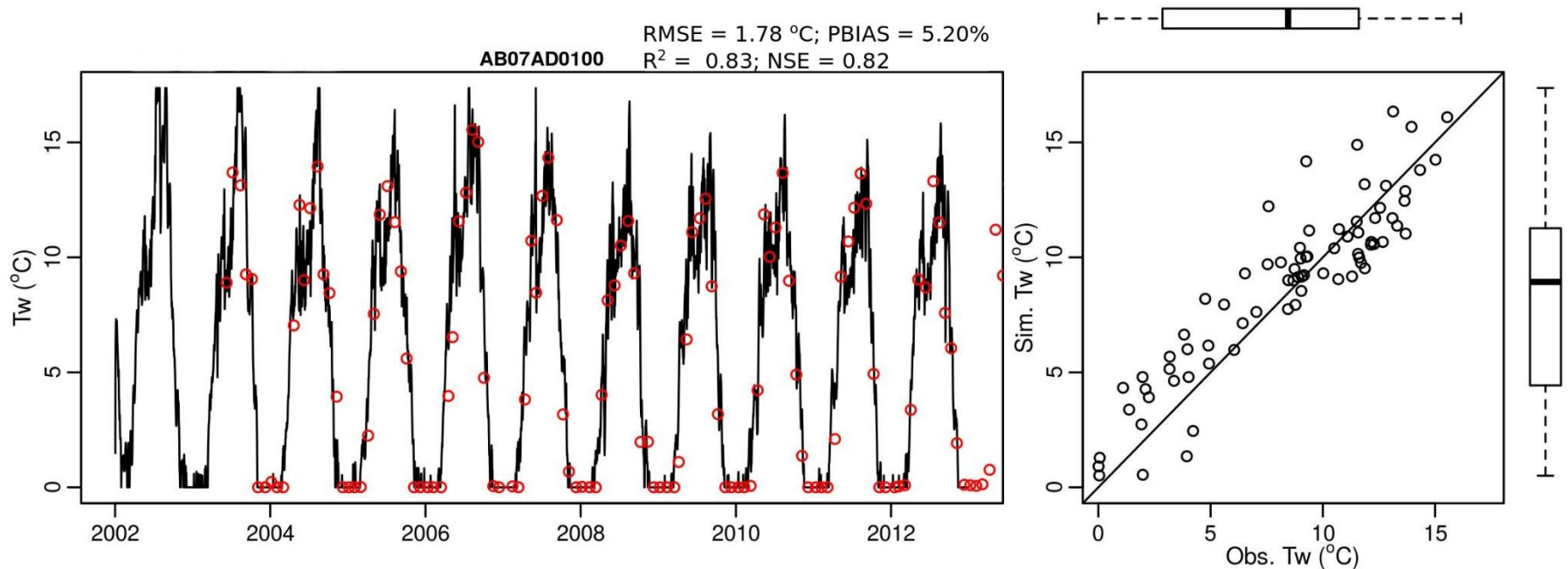


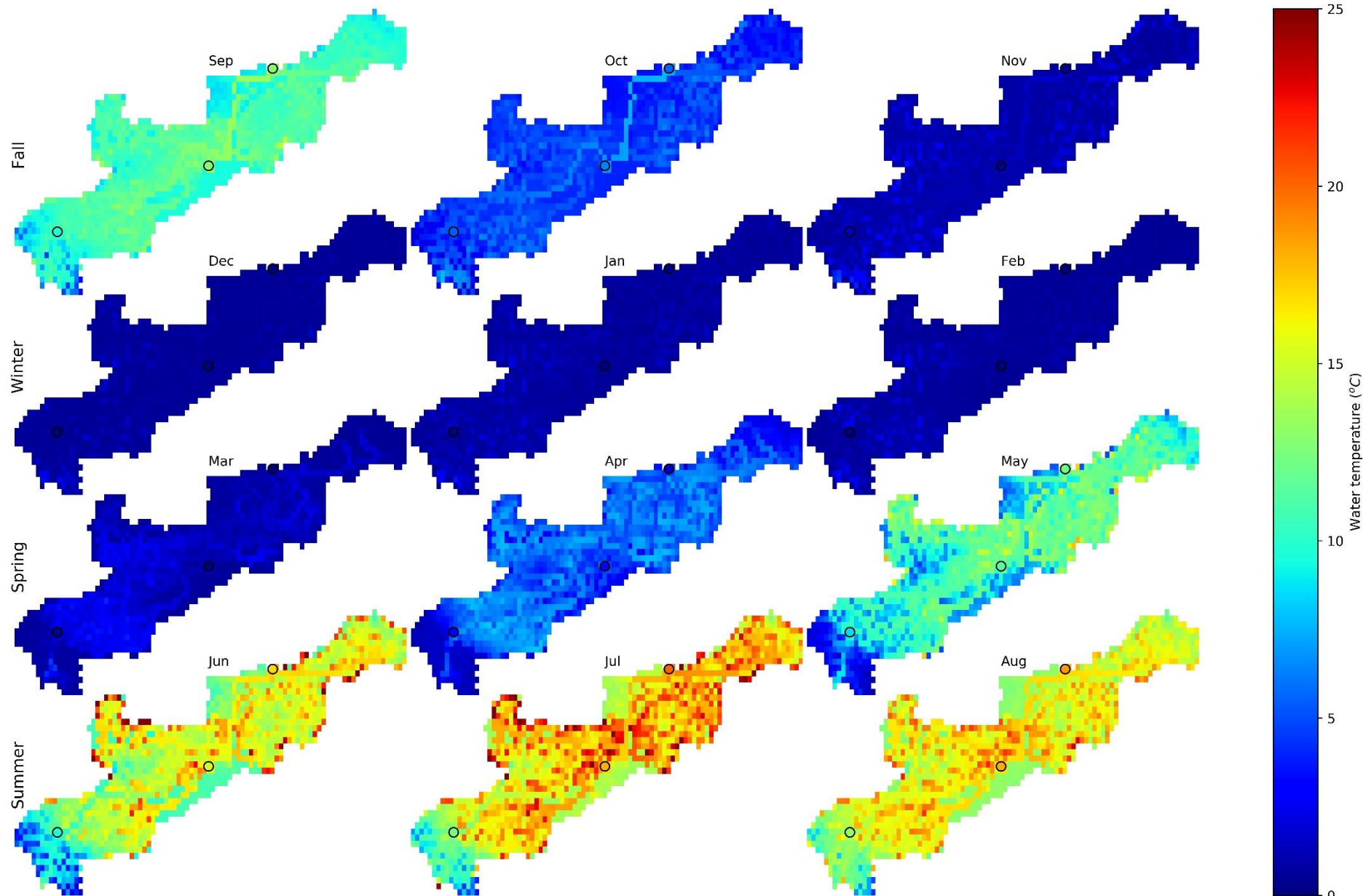
Landsat 8 image





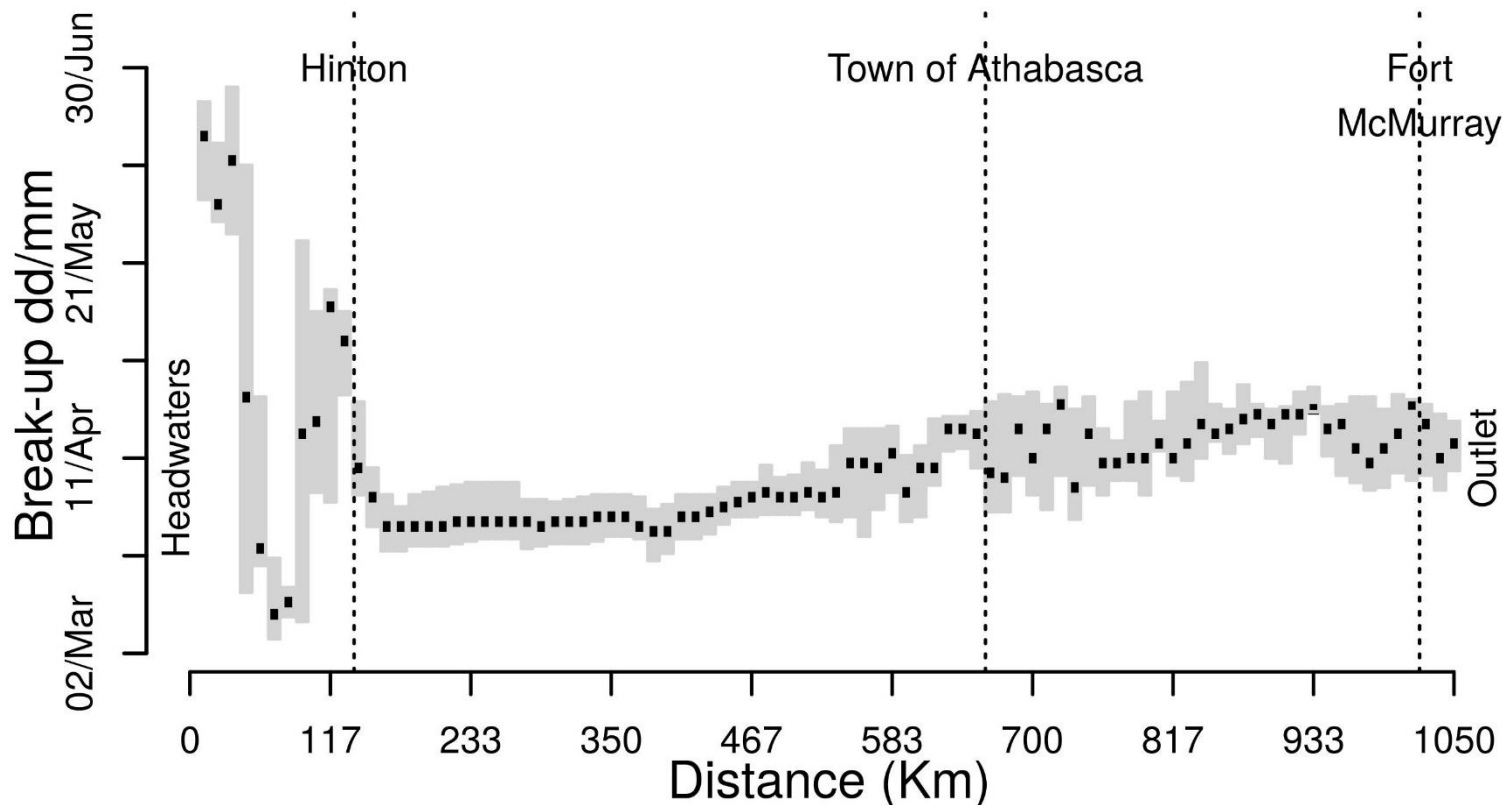
Water temperatures at Hinton





Water temperature ($^{\circ}\text{C}$)

Breakup date profile



RIFHA – Real near-time flood hazard assessment

Funding and Radarsat-2 data from CSA's EOADP



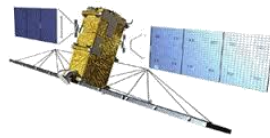
Integrated Modelling
Program for Canada

ter Futures

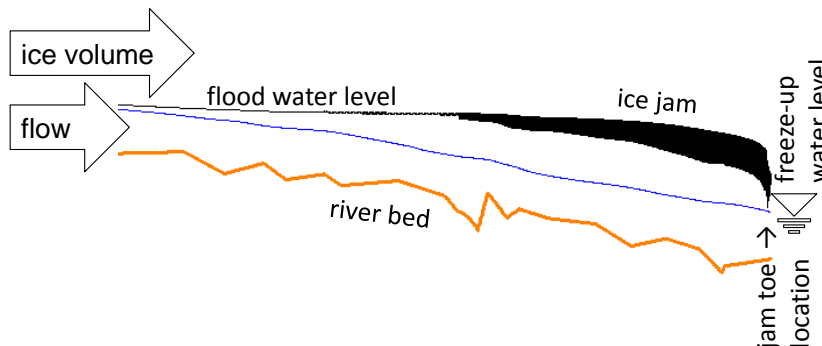
(1) Remote sensing:

provides info on

- ice types
- ice thicknesses
- upstream ice extent



(2) Stochastic, real-time, river ice flood modelling:



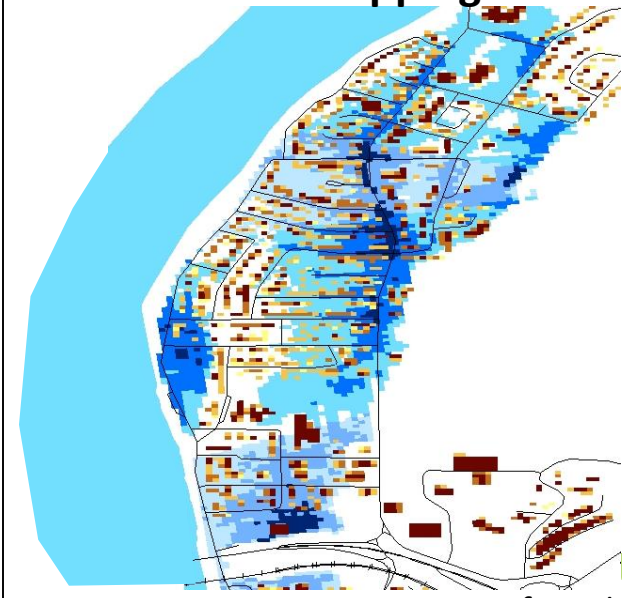
(4) Flood advisories & warnings:

provides info for

- decision support
- preparedness measures
- disaster management

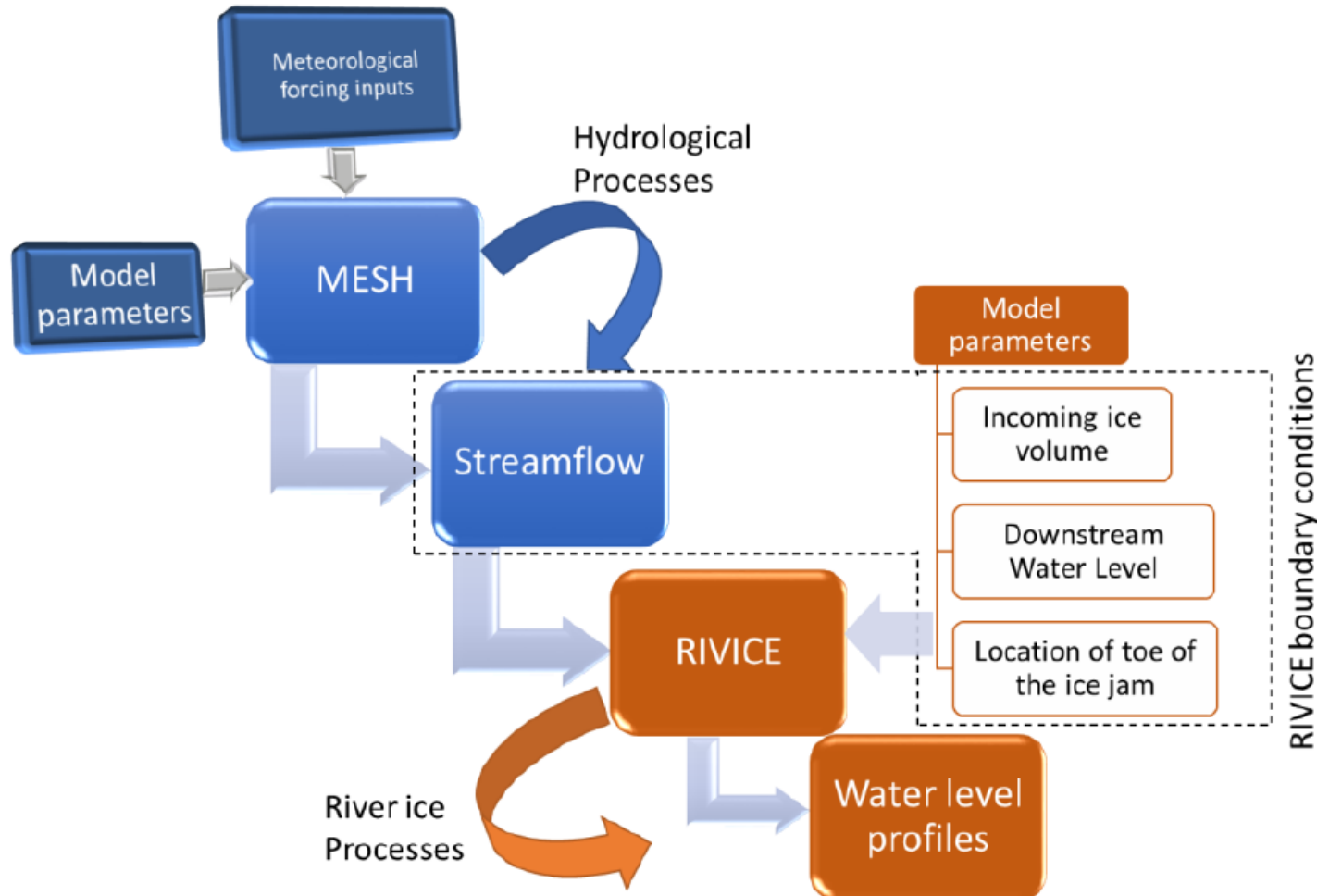


(3) Dynamic flood hazard assessment & mapping:

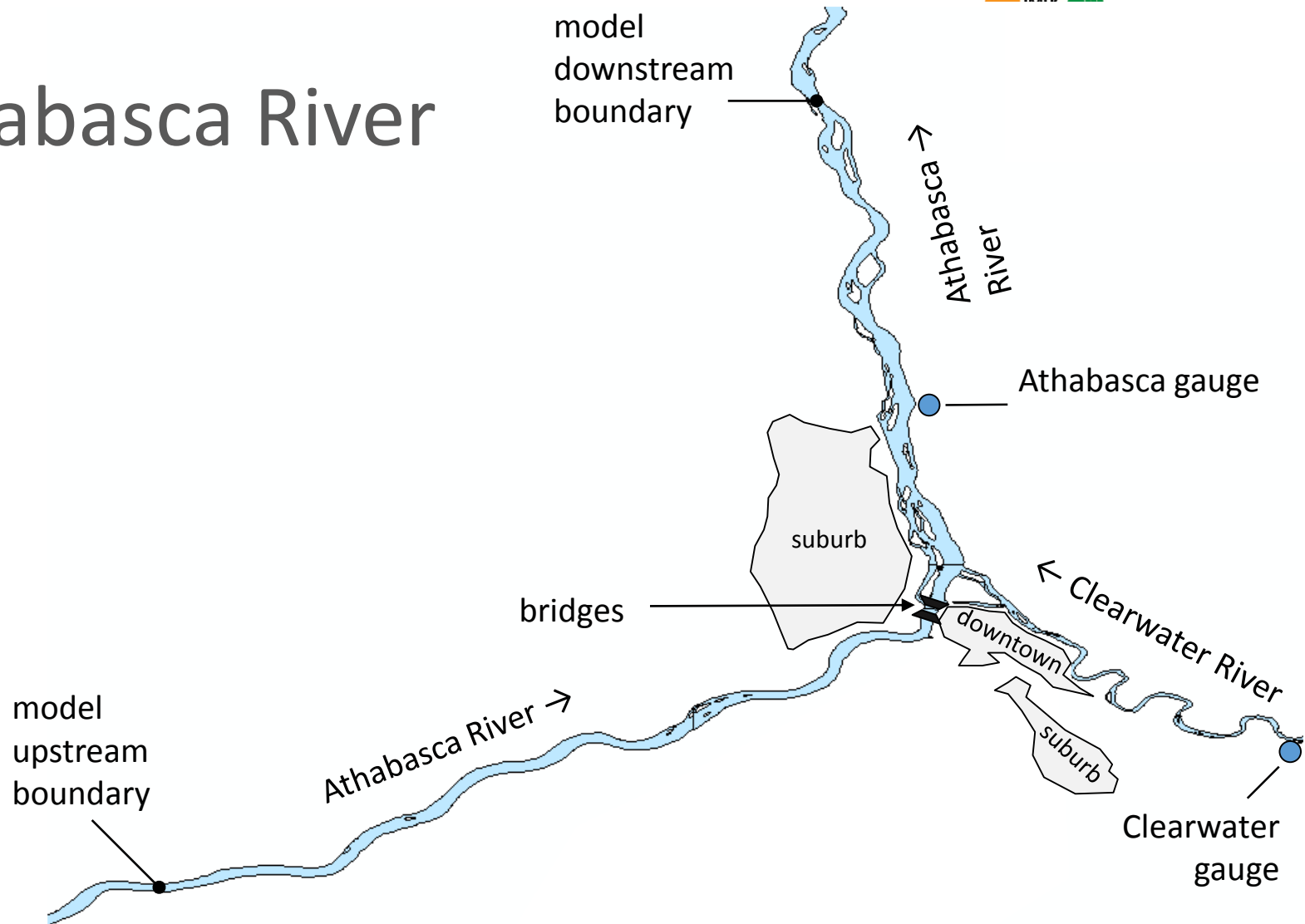




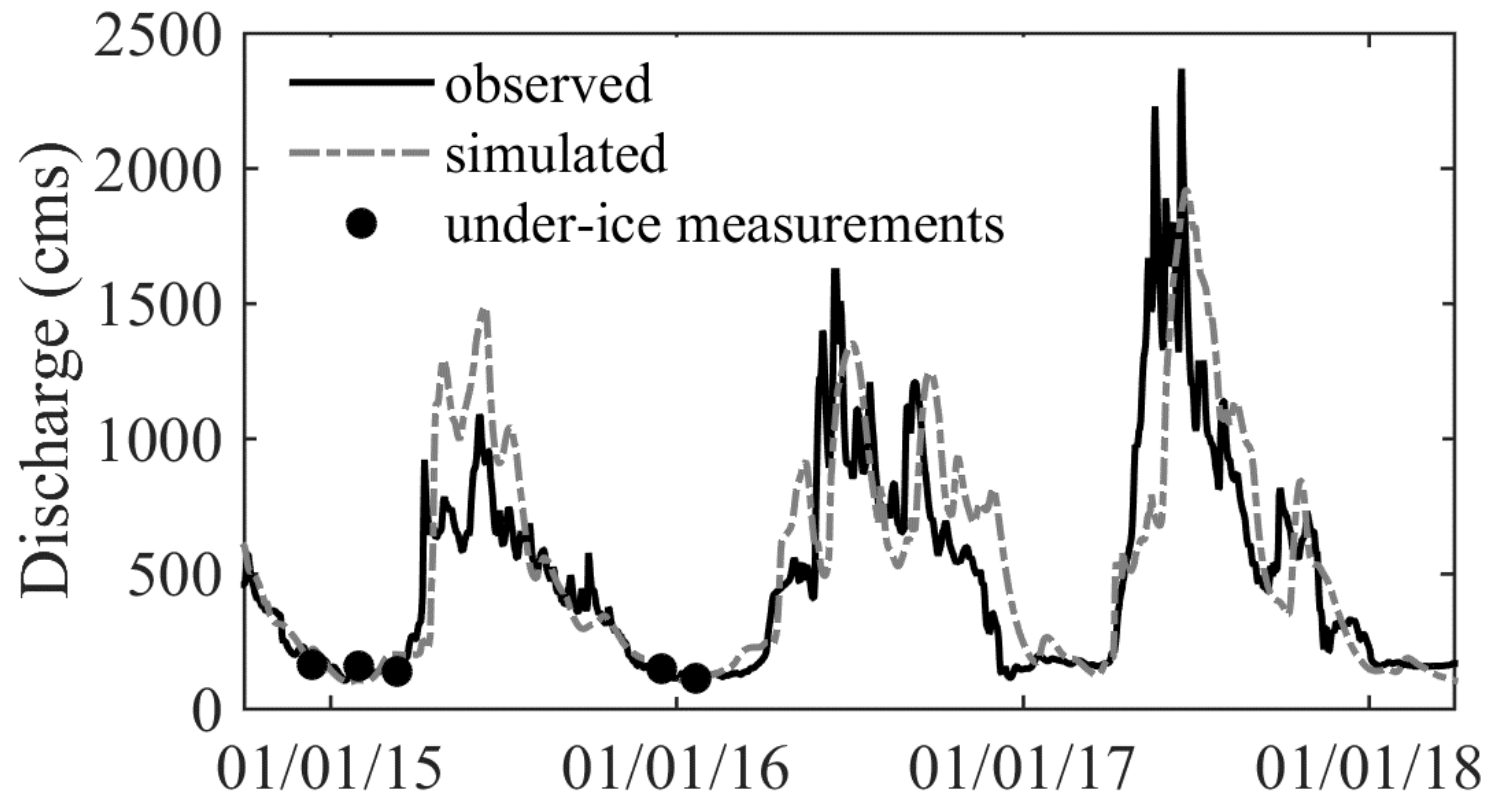
MESH – RIVICE coupling for operational ice-jam flood forecasting



Athabasca River

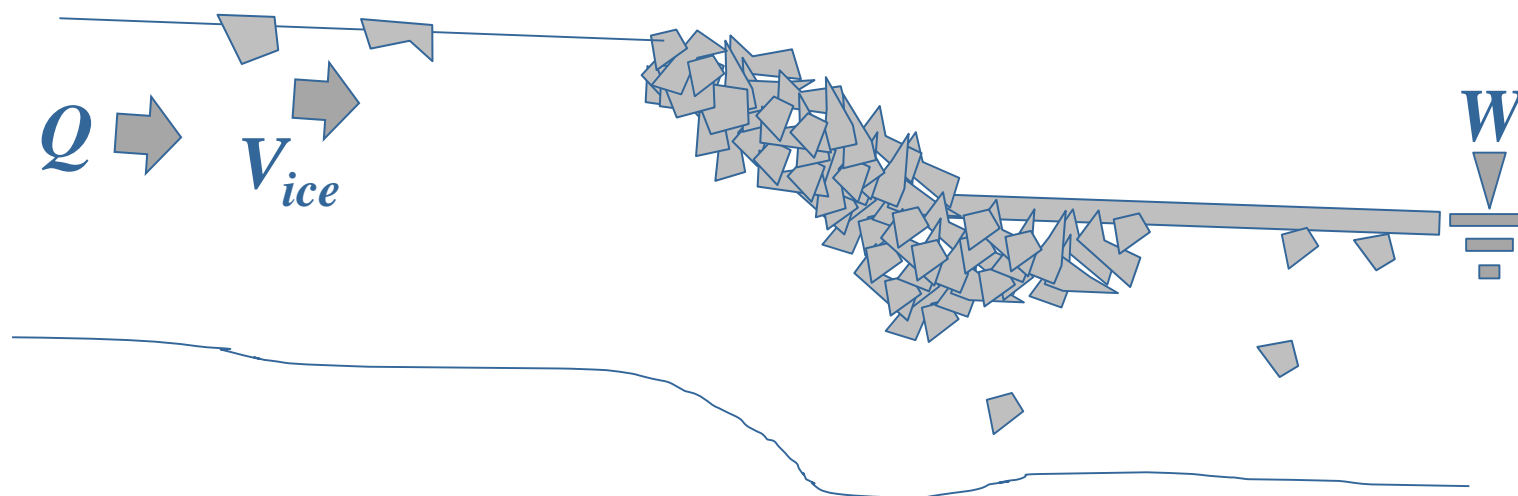


MESH secondary calibration

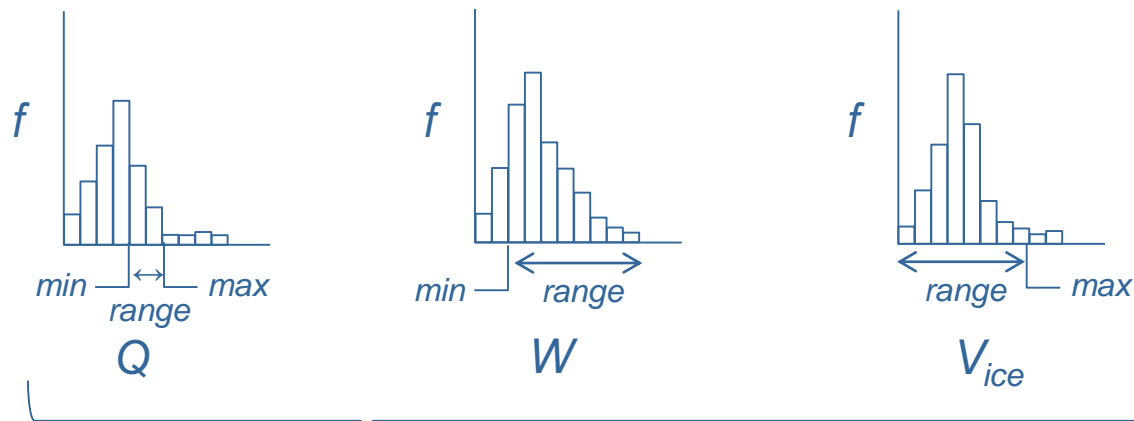




RIVICE forecasting boundary conditions



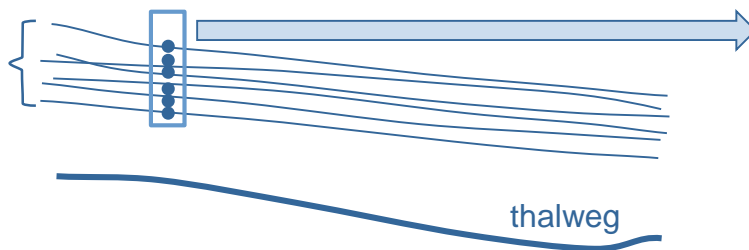
Stochastic modelling framework



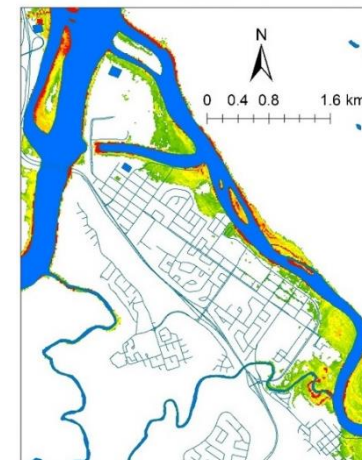
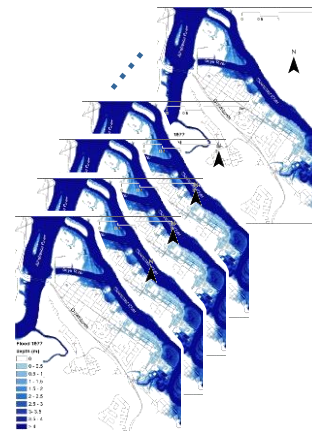
Monte-Carlo simulations

confluence

water level
profile
ensemble

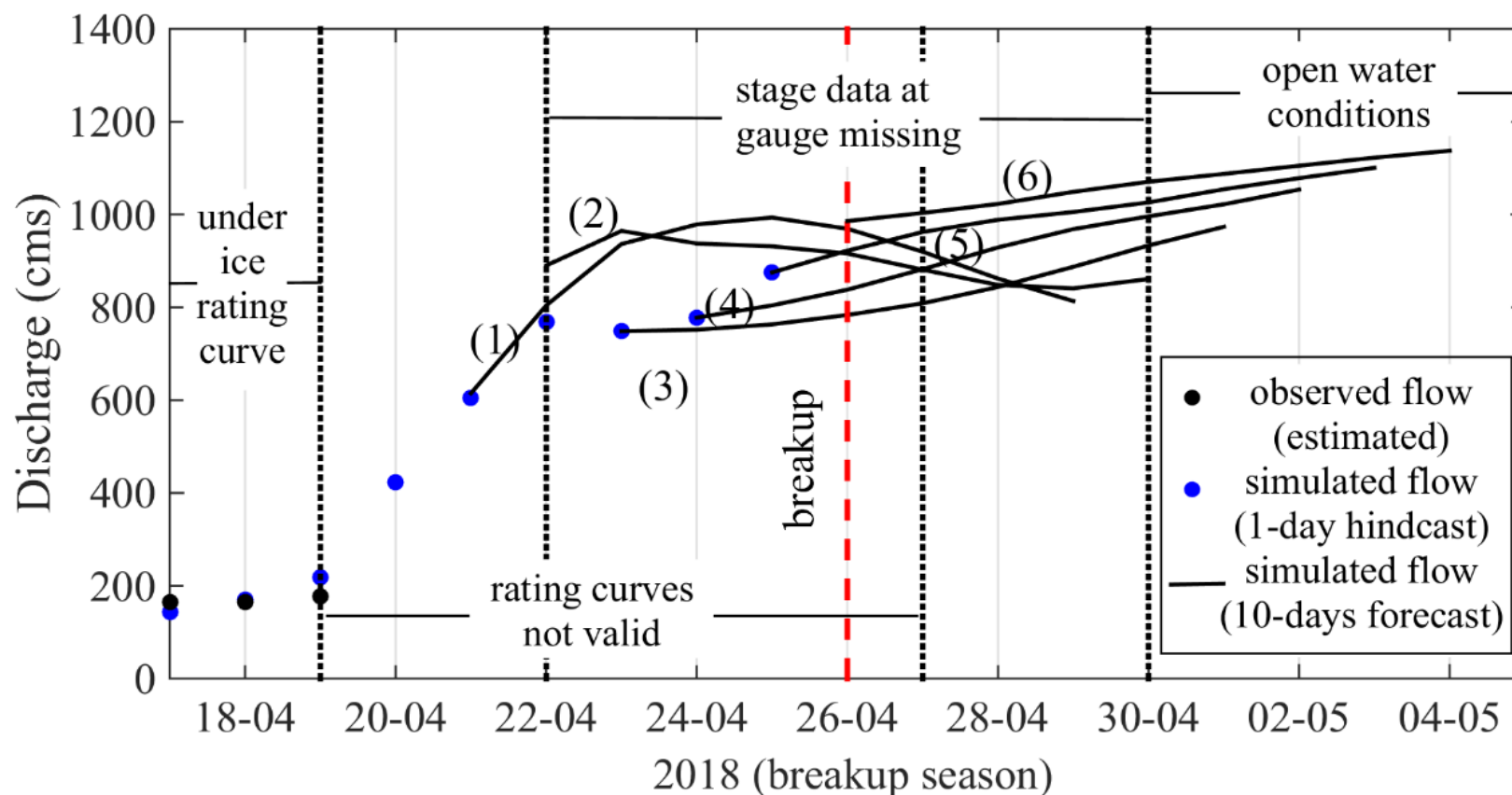


thalweg



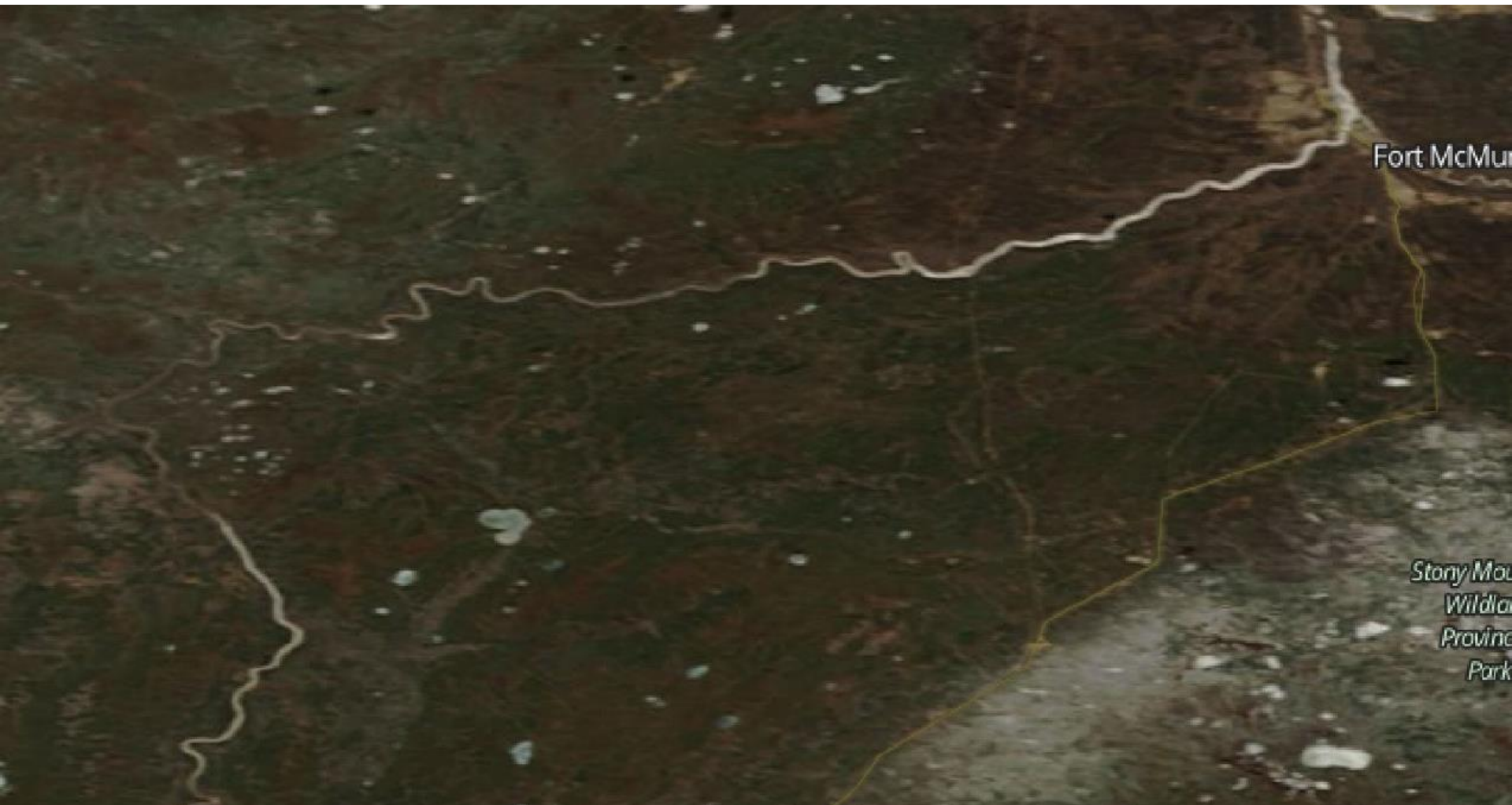


MESH 10-day forecasts



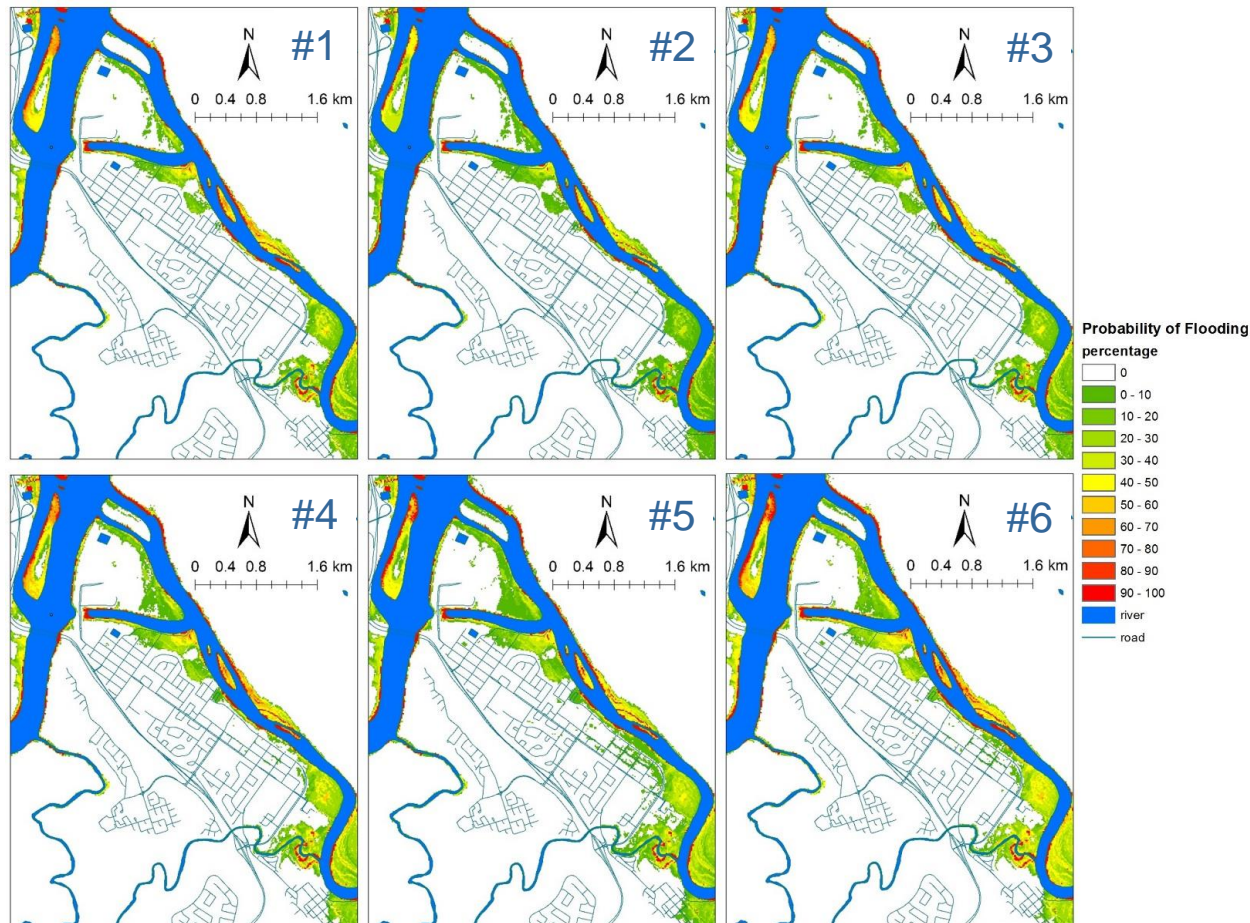


MODIS Terra Image – 26 April 2018





Flood extent hazard maps of six forecasts prior to ice-out at Fort McMurray





Future work

- MESH – RBM coupling
 - juvenile Athabaskan Rainbow Trout ($8^{\circ}\text{C} - 10^{\circ}\text{C}$)
 - with Jeff Sereda, Water Security Agency
- MESH – RIVICE coupling
 - Ice-jam flood forecasting of Red River
 - with Bin Luo & Chris Propp, Manitoba Infrastructure
- MESH – SED coupling
 - sediment and nutrient transport
 - with John-Mark Davies (WSA) and Mike Renouf (PPWB)



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