Representing Large Multichannel Rivers in Flood Models: A Look at the Congo River

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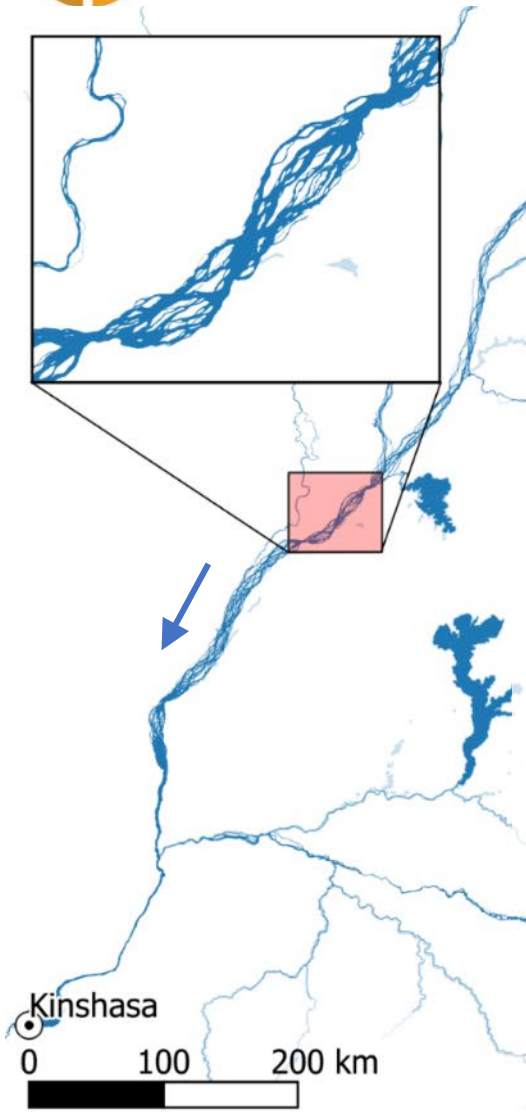
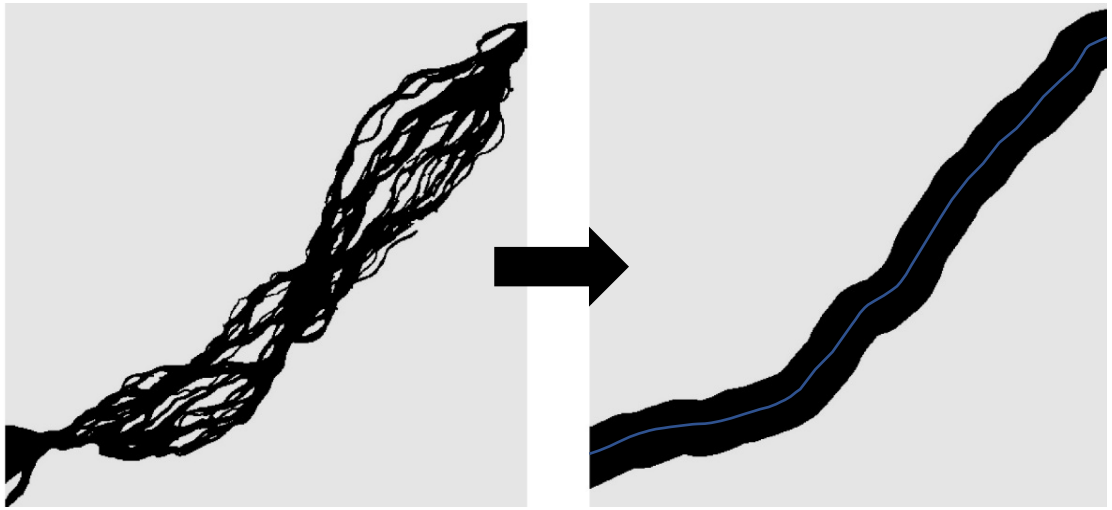
Background to Study



- Multi-channel river systems are often represented with a highly simplified geometry in hydrodynamic models.
- Research into the validity of this simplification is lacking
- Here, we use hydraulic model experiments to examine the effects of simplifying the Congo mainstem to a simple single channel.

Model Experiments

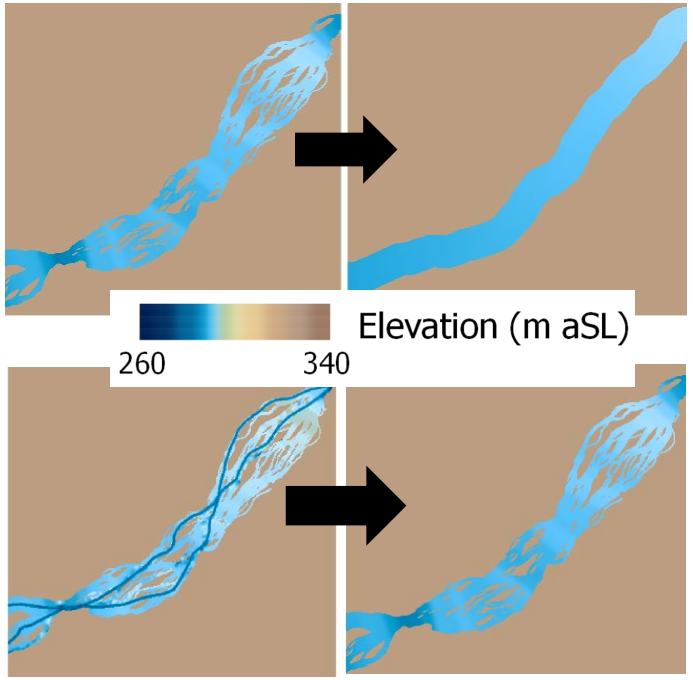
- Simulated seasonal hydrograph
- Reach-averaged cross-sectional area width conserved
- Model solver and dimensionality held constant
- Assume no out-of-bank flows (floodplain not represented)
- Friction coefficient initially held constant, but later varied

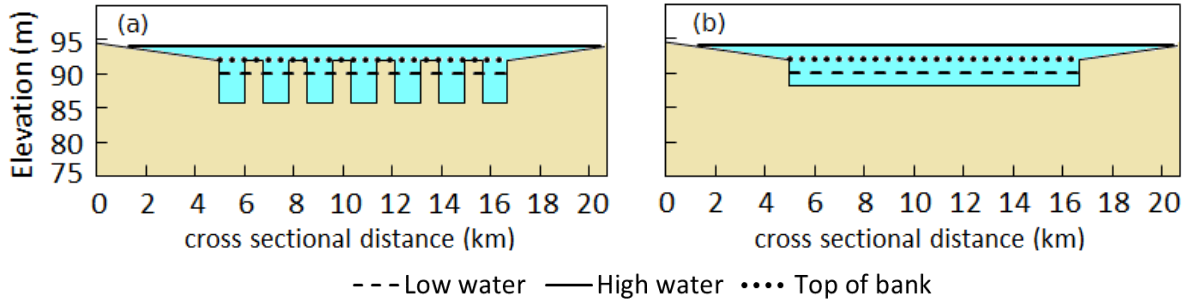


Model Experiments

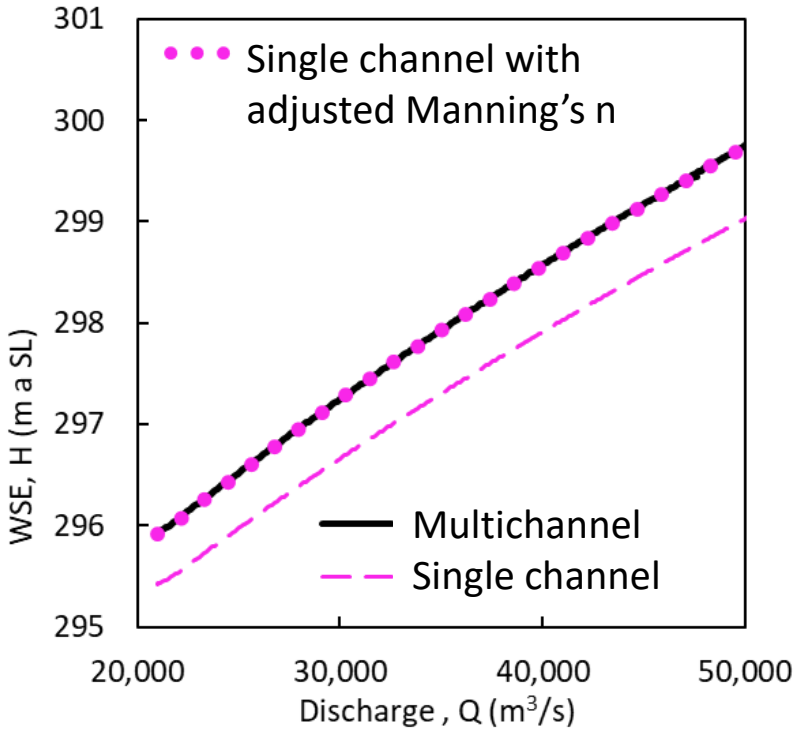
Three separate experiments looking at individual components of multichannel geometry that are neglected:

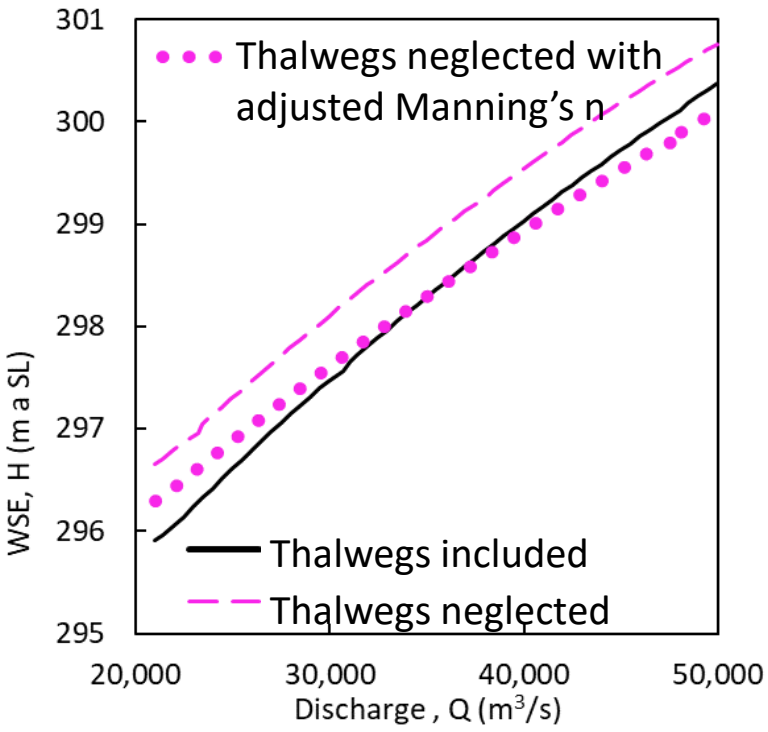
1. planform sinuosity of individual channel threads
2. variation in the channel bed elevation
3. Mid-channel island terrain

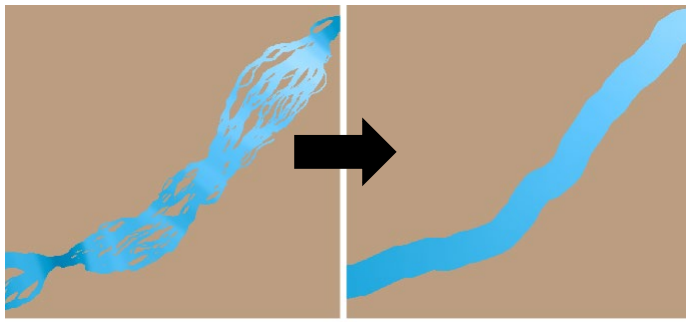


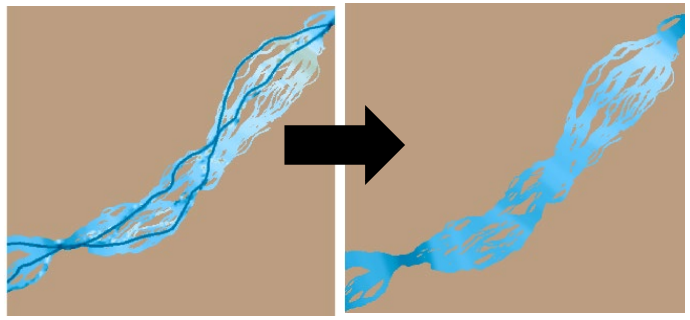


Results: Experiment (1) and (2)

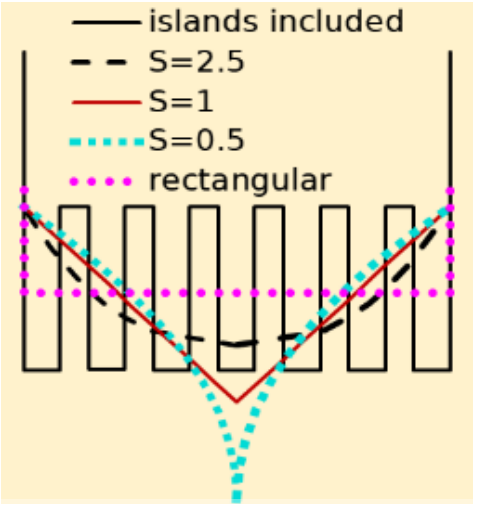






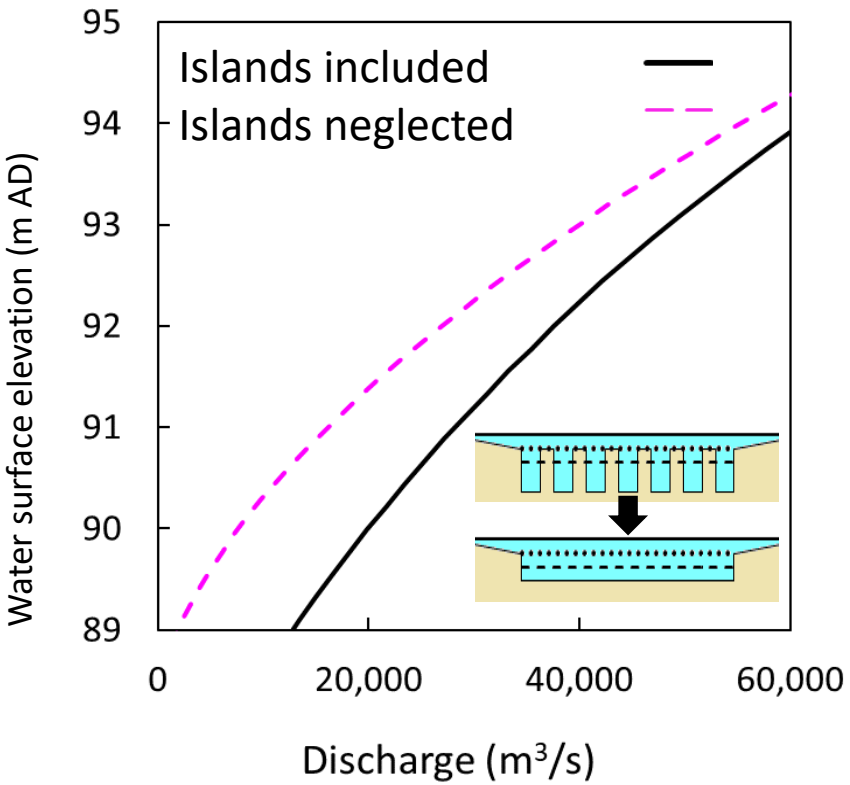


Results: Experiment (3)

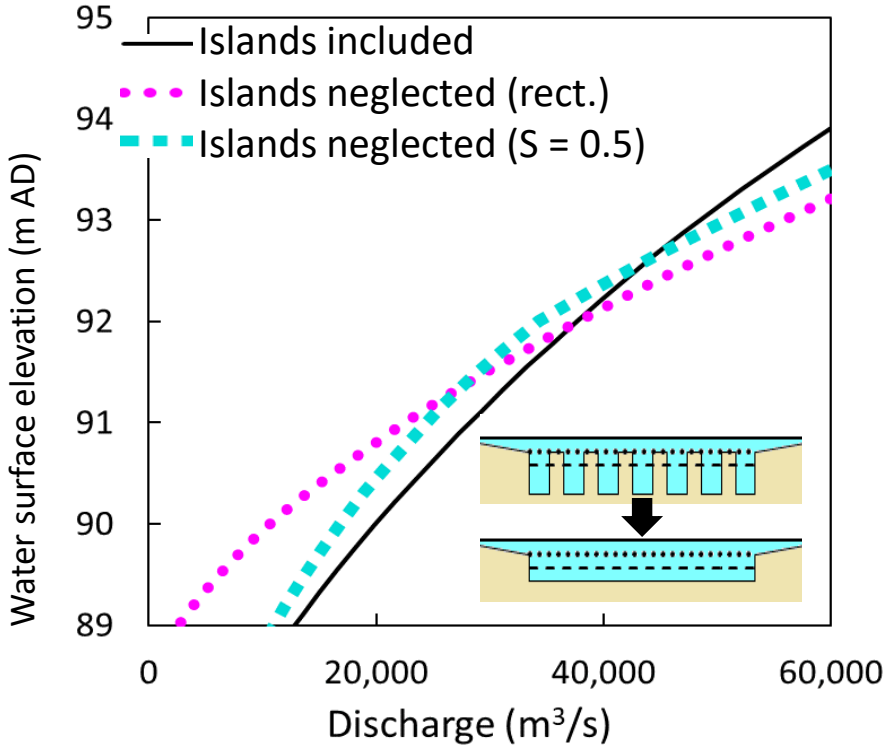


Adapted from Neal et al. (2015)

Friction held constant

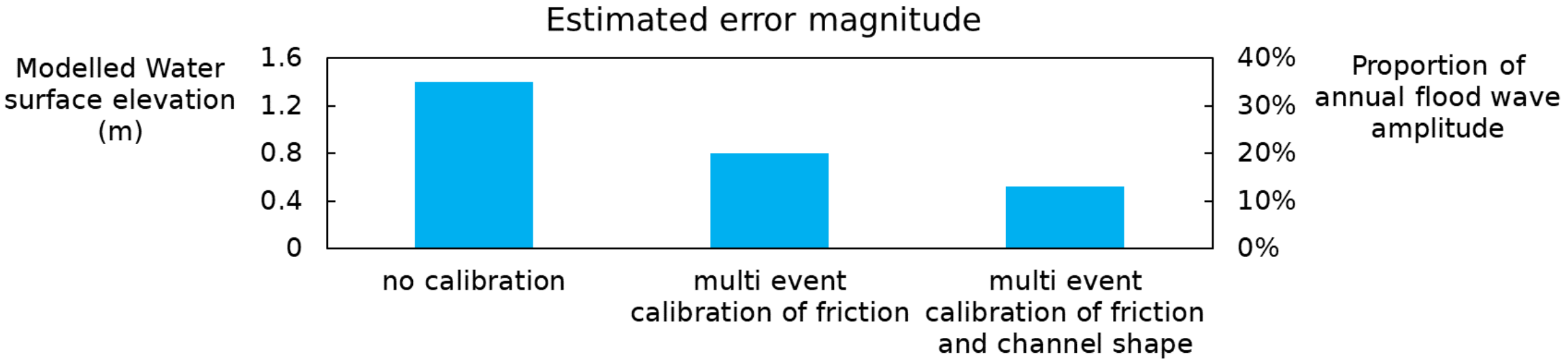


Friction (and channel shape) varied



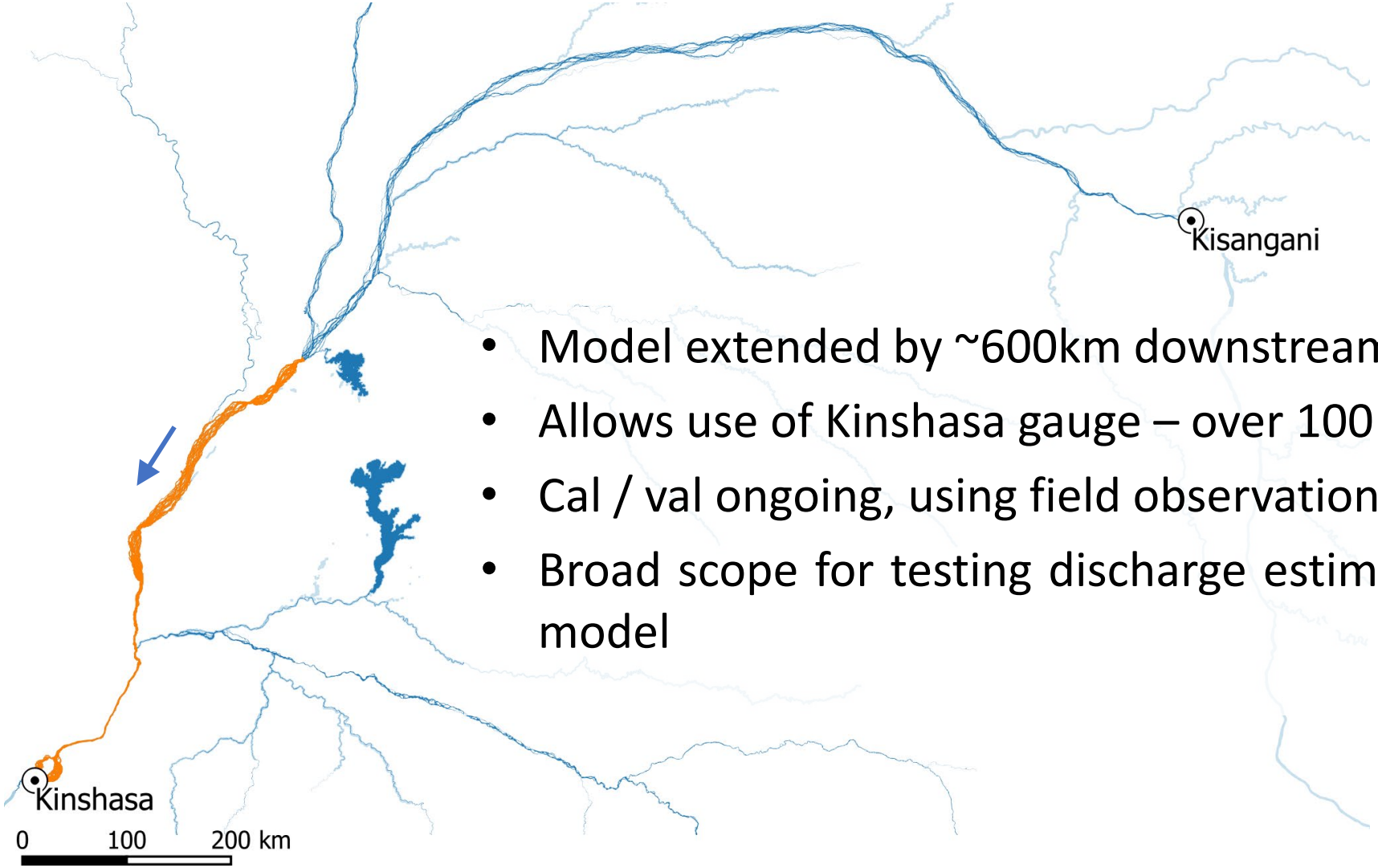
Summary of Findings

- Using an effective single channel in a hydrodynamic model of the multichannel Congo River will introduce considerable errors in water level predictions:



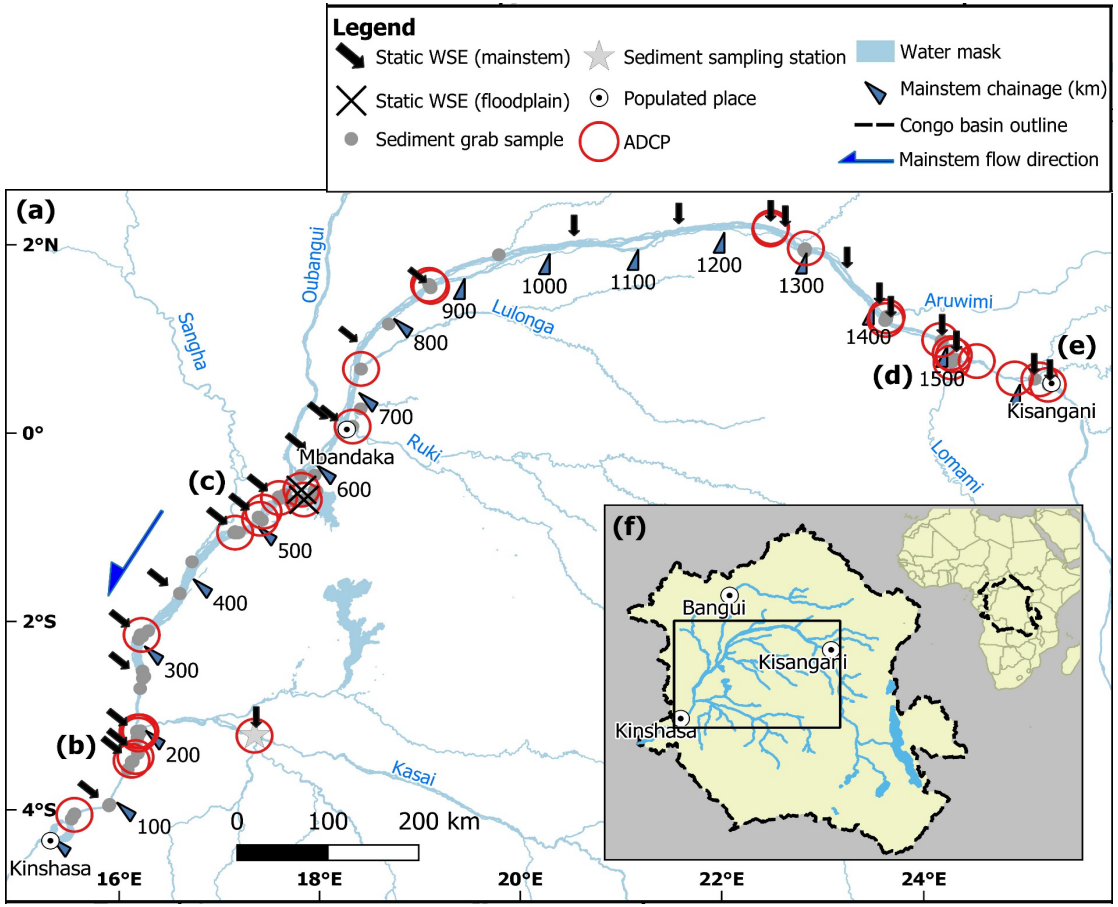
- Neglecting mid-channel islands is the main source of error
  - ➢ Recommend explicit representation of island morphology

Ongoing work



- Model extended by ~600km downstream to Kinshasa
- Allows use of Kinshasa gauge – over 100 years of daily Q & H data
- Cal / val ongoing, using field observations of WSE and Q
- Broad scope for testing discharge estimation algorithms with this model

CRREBaC Facilitated Fieldwork



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Thank you for your attention

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