

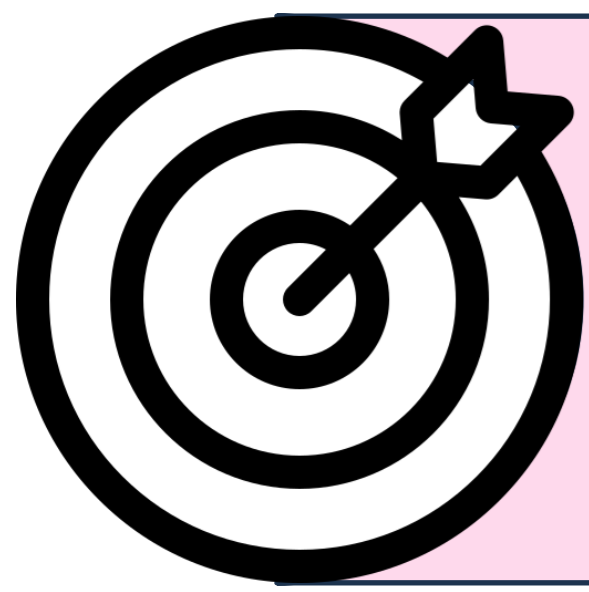
Hydrodynamic Modeling of Circulation Patterns in Amazonian Rivers and Estuaries around Belém, Brazil

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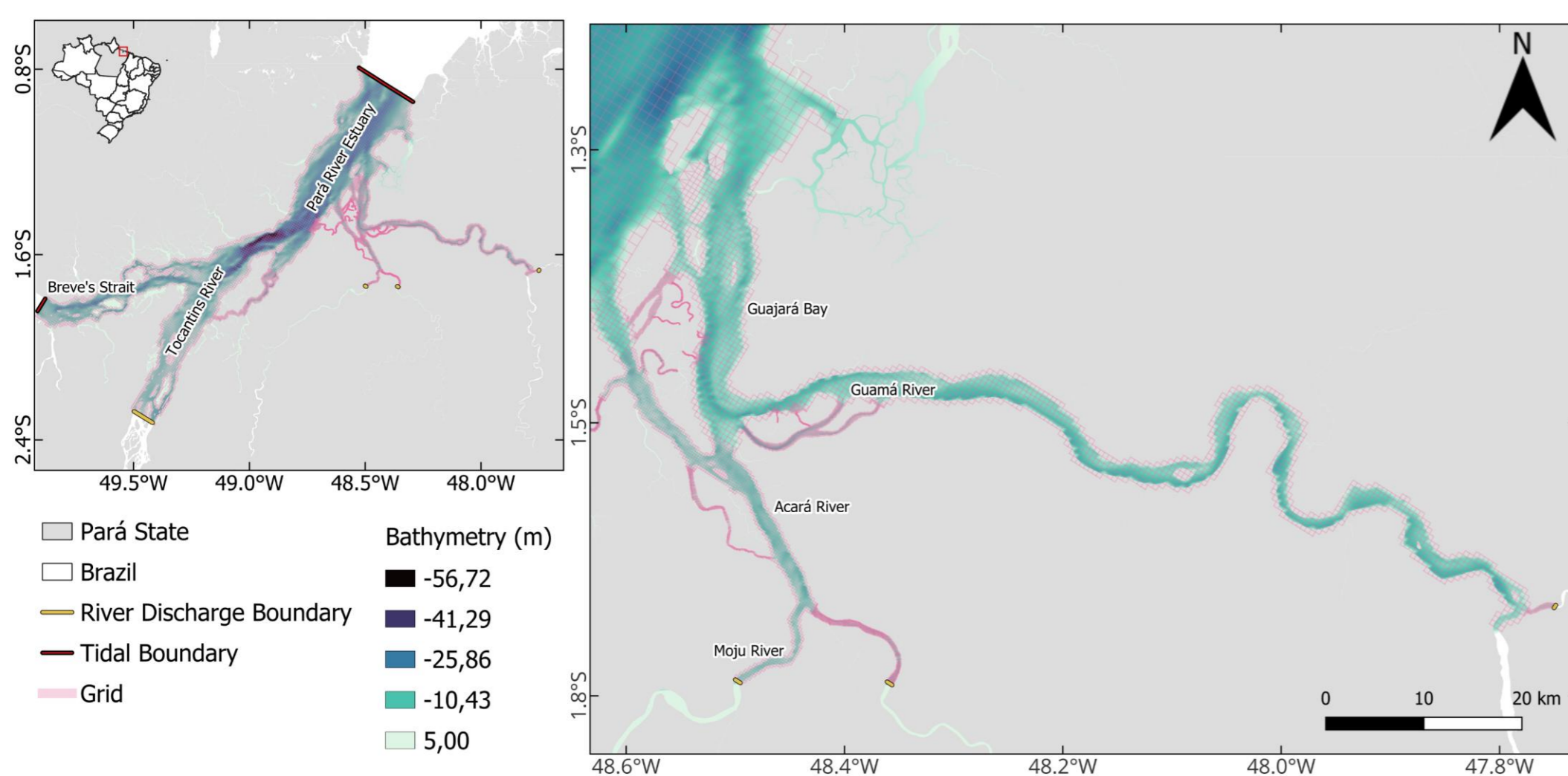
INTRODUCTION & AIM

Hydrodynamic models are essential for understanding **water bodies' circulation**, as well as supplying studies regarding **pollutant transport**, especially in **large water bodies**, where in-situ observations are challenging.



Analyze circulation patterns under high (HD) and low river discharge (LD) and along tidal cycles

METHOD



SOFTWARE

- Delft3D-Flexible Mesh

DOMAIN

- Unstructured grid
- Cells: 1,000,000 to 40 m²

BATHYMETRY

- Interpolated from data from the LAPMAR database

ROUGHNESS

- Manning's roughness coefficient

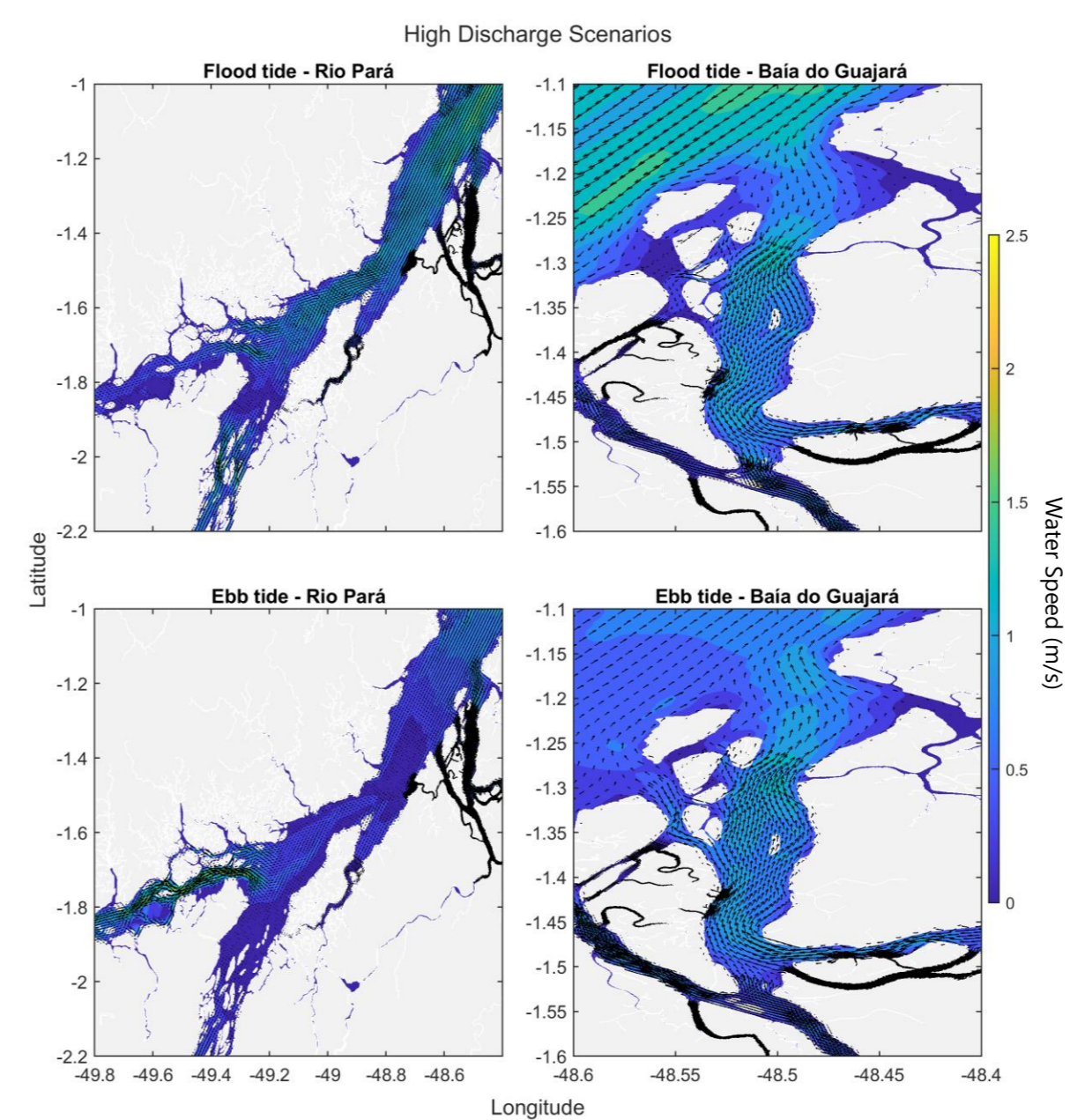
FORCING

- Tidal boundaries
- River discharge boundaries

CALIBRATION

- r
- NSE
- pRMSE

RESULTS & DISCUSSION

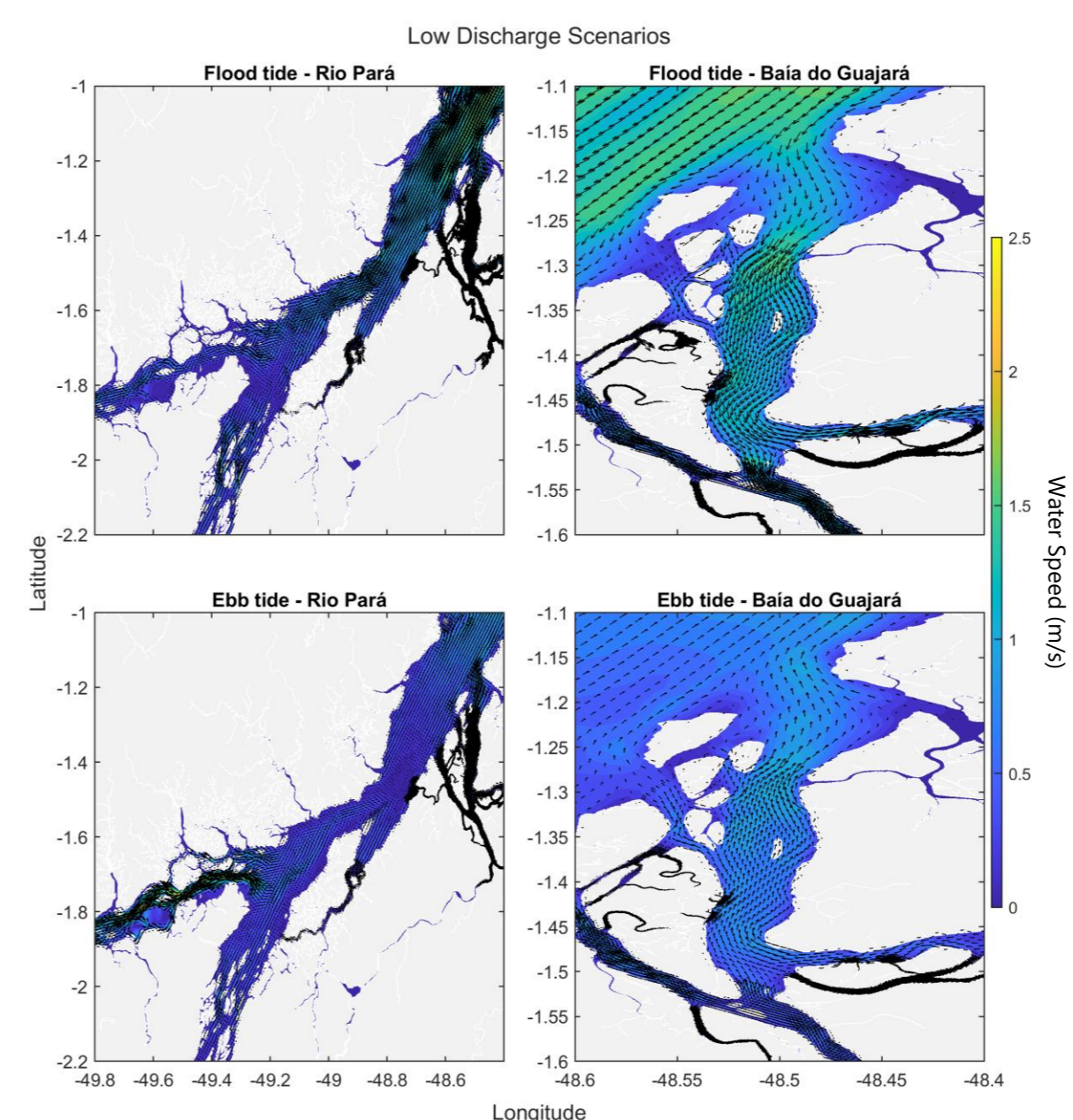


Pará River Estuary:

- Flood: higher velocities in the lower estuary;
- Ebb: higher velocities in the higher estuary;
- Persistent upstream flow in the higher estuary.

Guajará Bay and Guamá River:

- Higher velocities along left margin;
- Low dynamics zone near Belém due to opposing flows during flood tide.



Pará River Estuary:

- Similar dynamics;
- Velocities slightly increased in both the upper and lower estuary during flood and ebb, respectively;

Guajará Bay and Guamá River:

- No low dynamics zone;

- Higher velocities along the left margin in the Guajará bay and Guamá river are explained by the presence of deeper channels;
- The Tocantins river drives the continuous upstream discharge near the Breves Strait;
- Low dynamics zone near Belém happen due to the interaction between the high river discharge and tidal currents.

CONCLUSION

Circulation patterns

- PRE exhibited stable circulation whilst GR and GB differed between season and tidal cycles;

Low-dynamics zones

- They might retain pollutants and litter near the city of Belém, posing as a health and environmental risk;

Water Quality assessment

- These findings highlight critical hydrodynamic patterns, providing a basis for studies regarding pollutant retention and dispersion if coupled to water-quality models.