A hydrological-hydrodynamic model of the Tocantins-Araguaia watershed

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Contacts

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General introduction

2º major Basin in Amazon Region

7 major hydroelectric plants

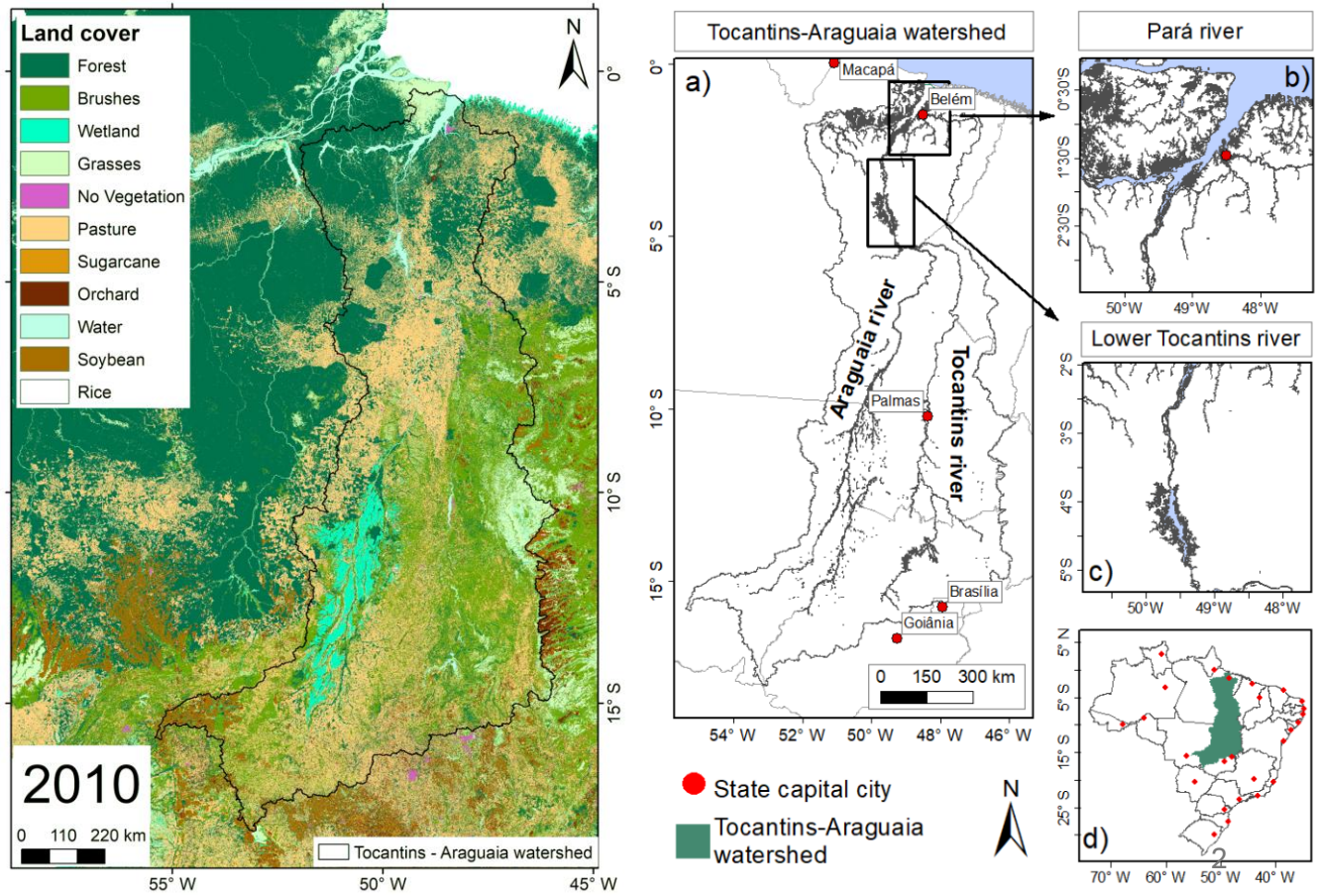
50% shows environmental alteration

Issues?

Pressure from deforestation, land-cover changes, and the expansion of agriculture and pasture.

Land use changes has **impact on precipitation and evaporation** regime

The Tocantins-Araguaia watershed (TAW) is within the Amazonia and the Cerrado biomes



Section of my research

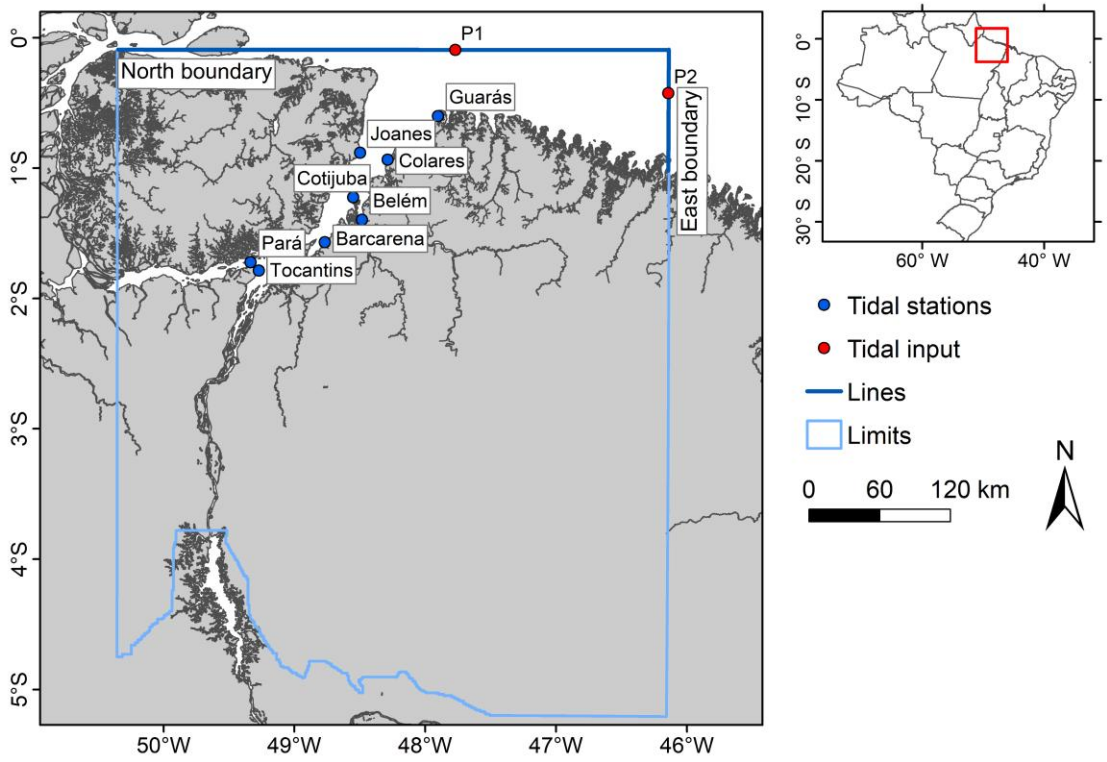
Coupling the models

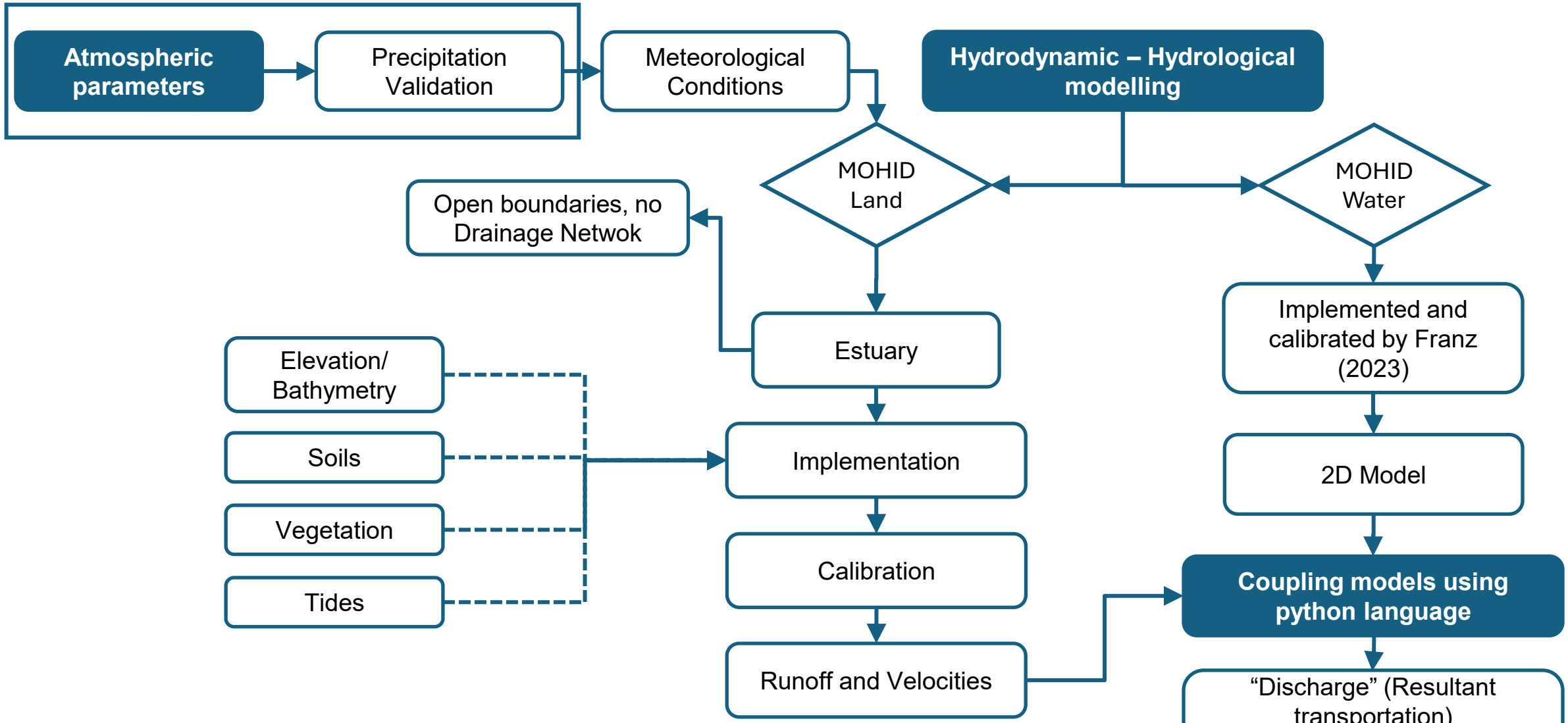
Pará river estuary ~500 km

The precipitation is around: **2000 mm to 3000 mm/year**.

What are the hydrodynamic changes that happens when we add runoff, a volume of water, into the hydrological model?

Beyond hydrodynamic, will it impact the salinity plume? Or the residence time?





General Methodology

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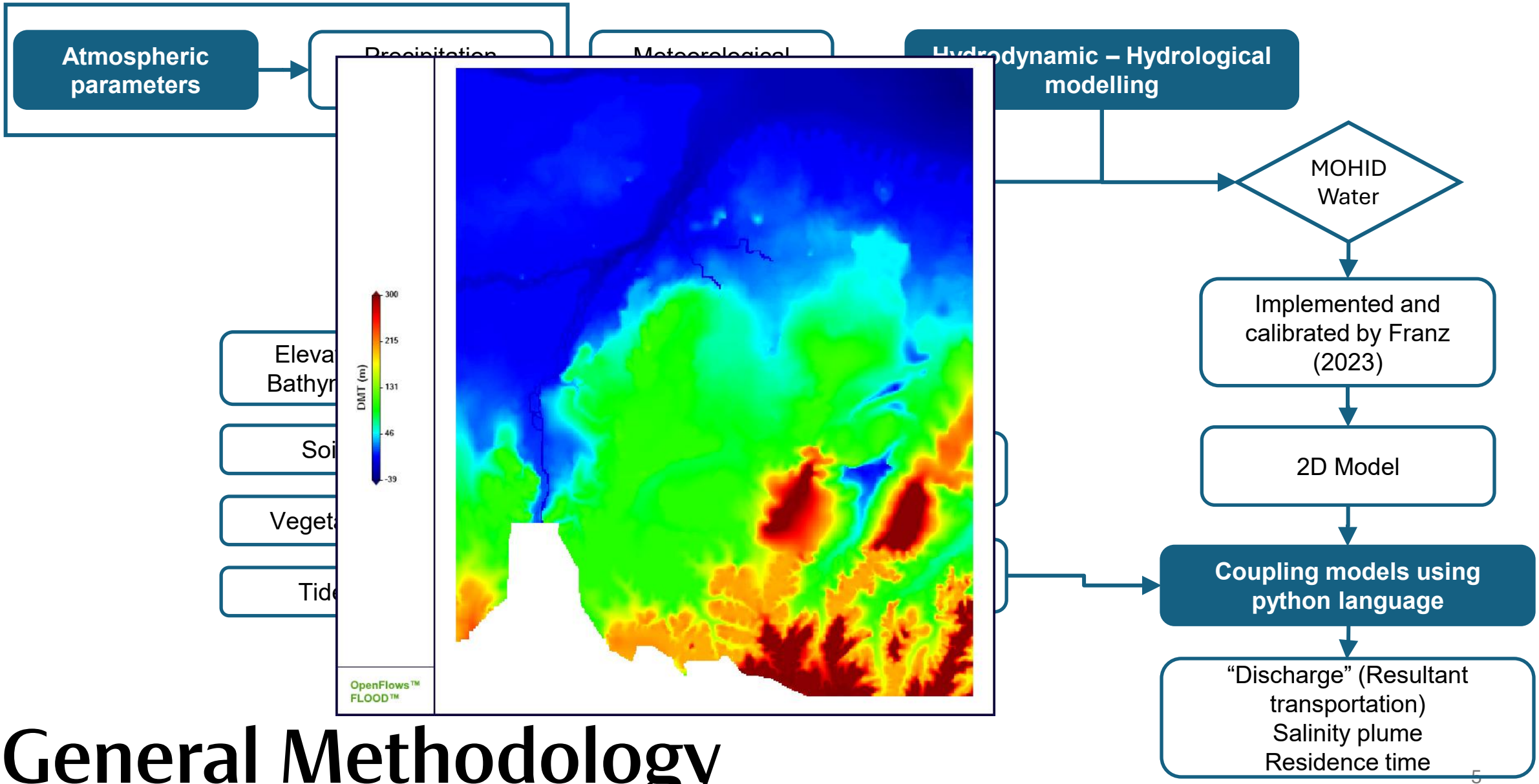
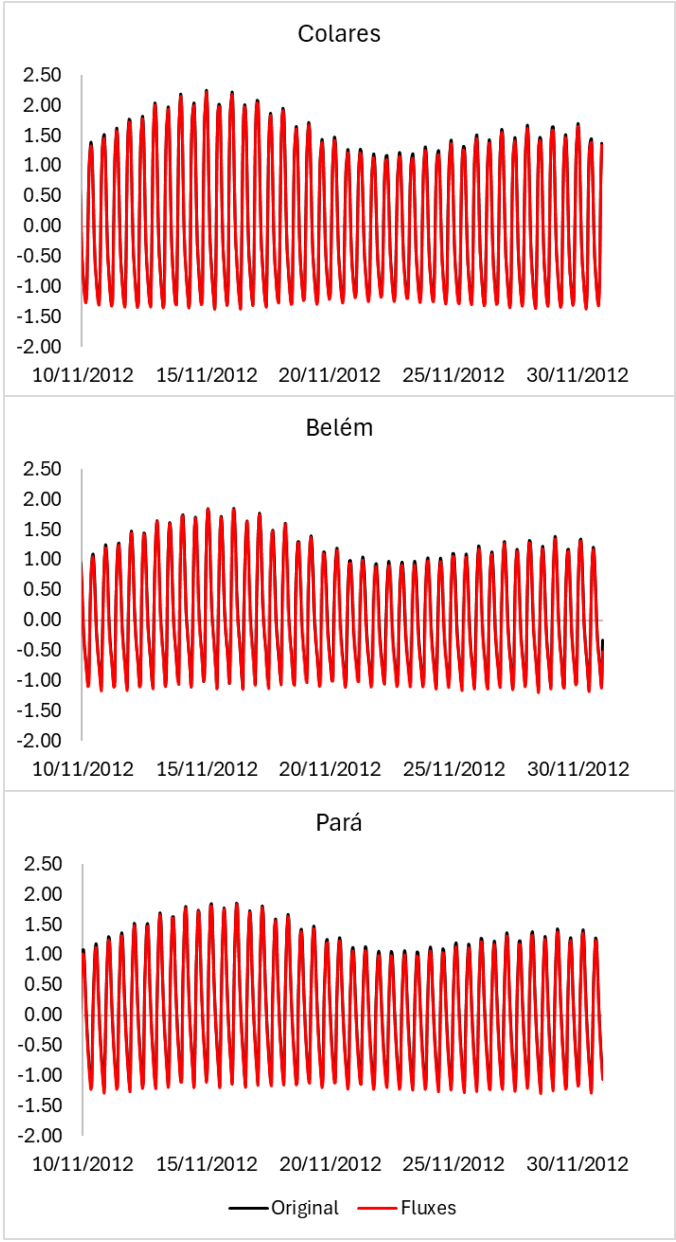
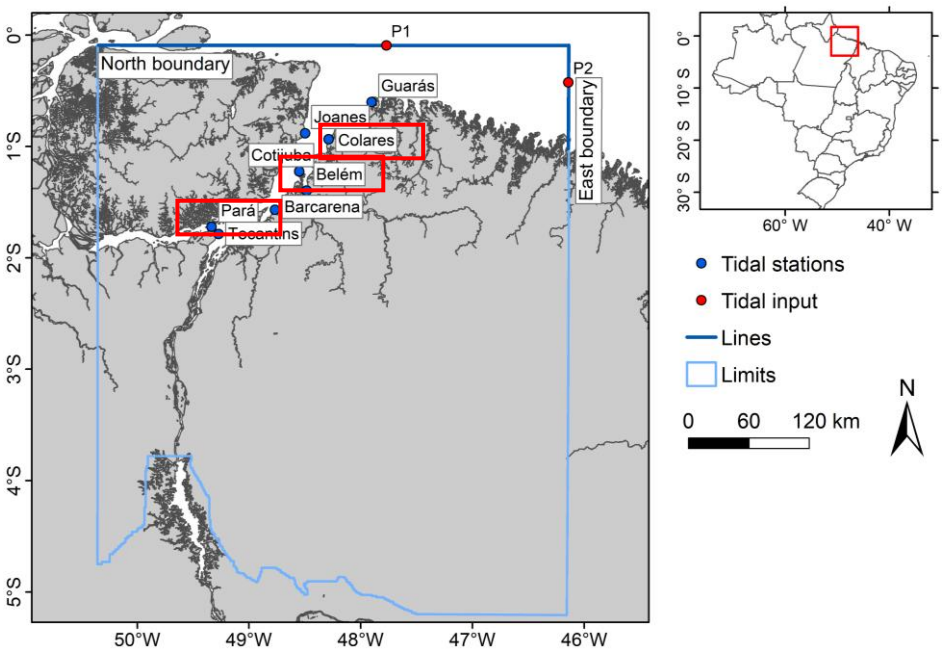


What changed?

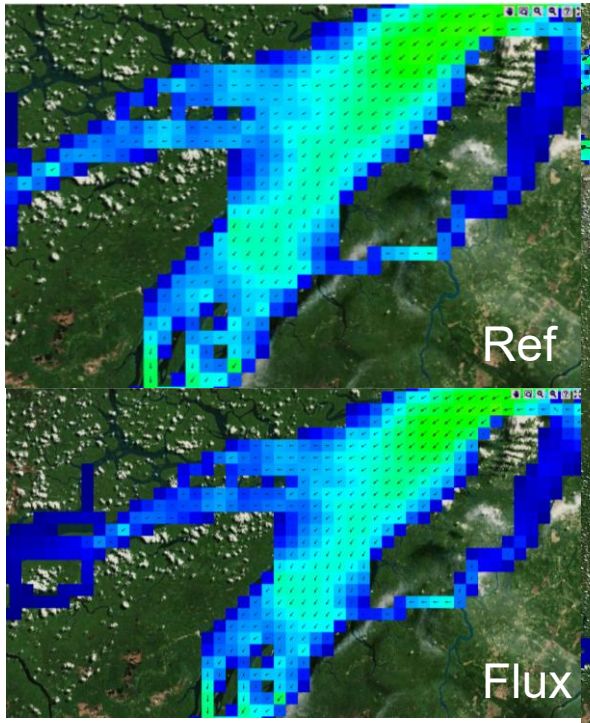
- Simulated for 2 months
- Initial Rainy season
- Nothing really changed beyond small movement related to the mean water level

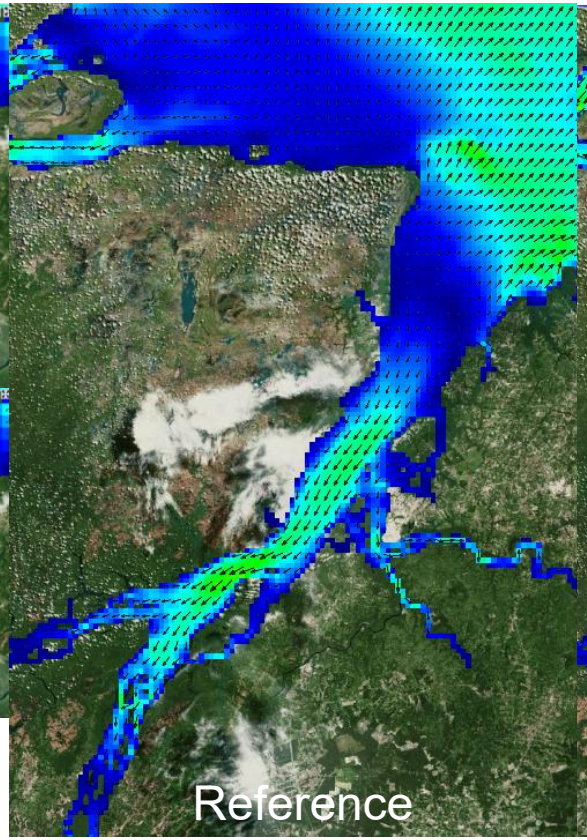


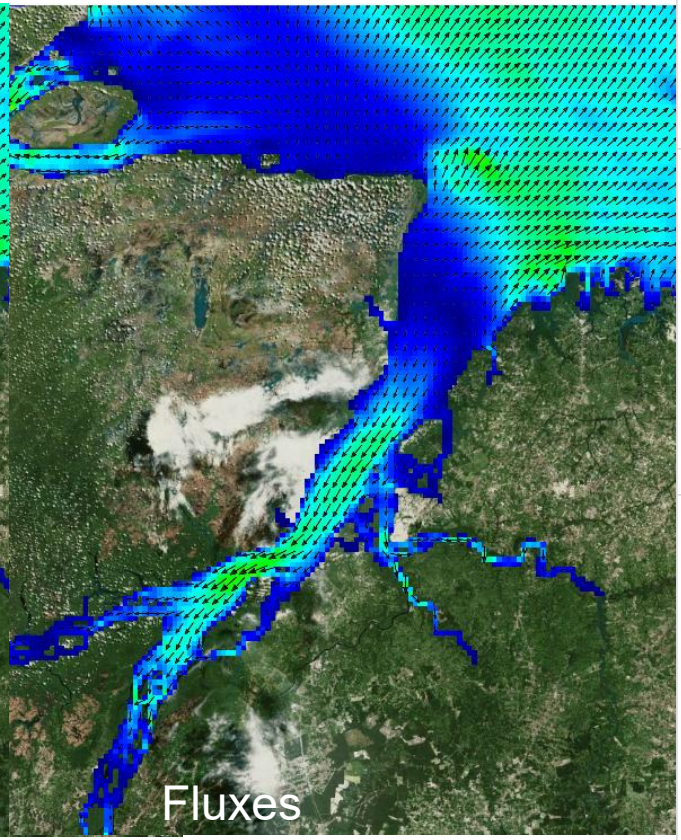


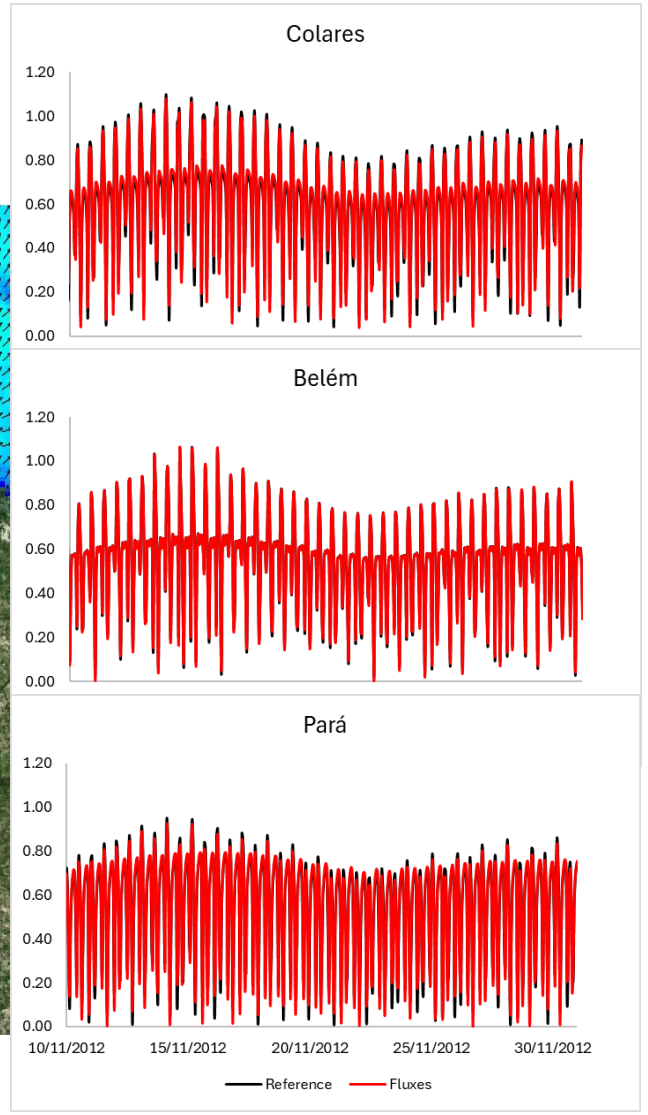
What changed?

There is a slightly difference in velocities.



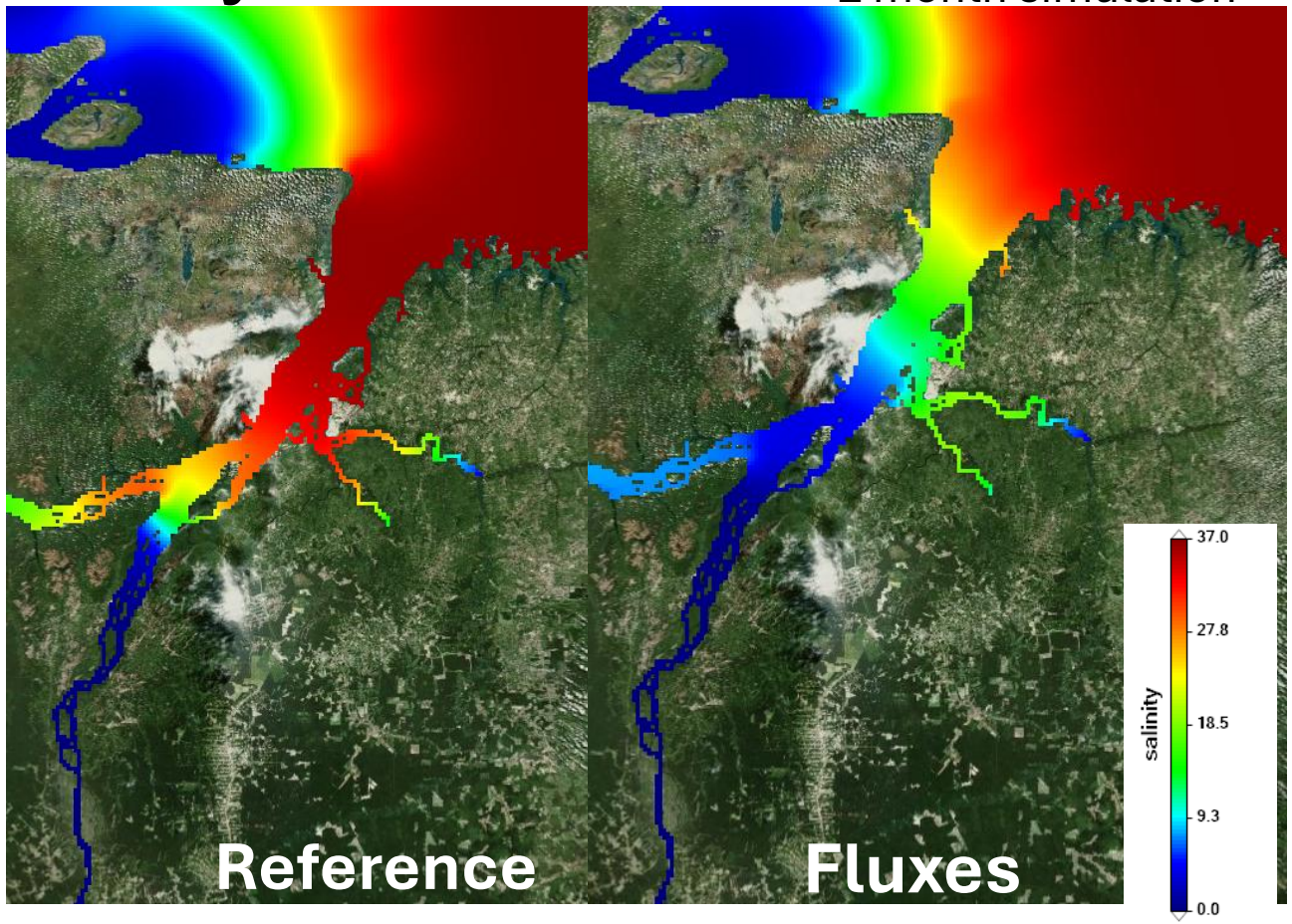






Salinity

2 month simulation



Needs to simulate longer

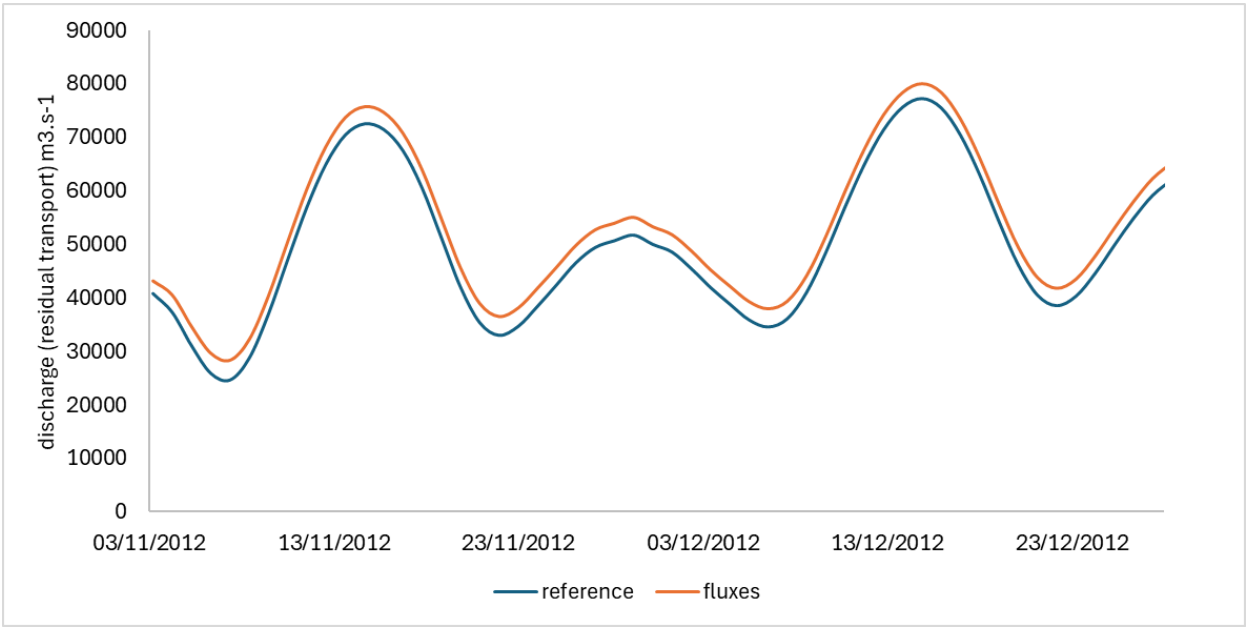
1y 6m?

Discharge

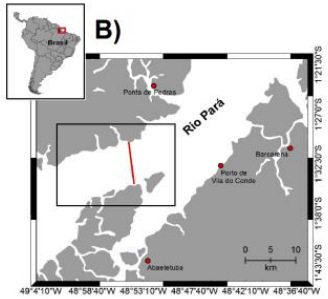
Tidal influence removed

Difference of 3000 m3.s-1

2 month simulation



Campanha	Transporte de Volume Resultante <Tv> (m³/s)
Maio / 2011	74.391
Setembro / 2011	45.387
Junho / 2013	10.828

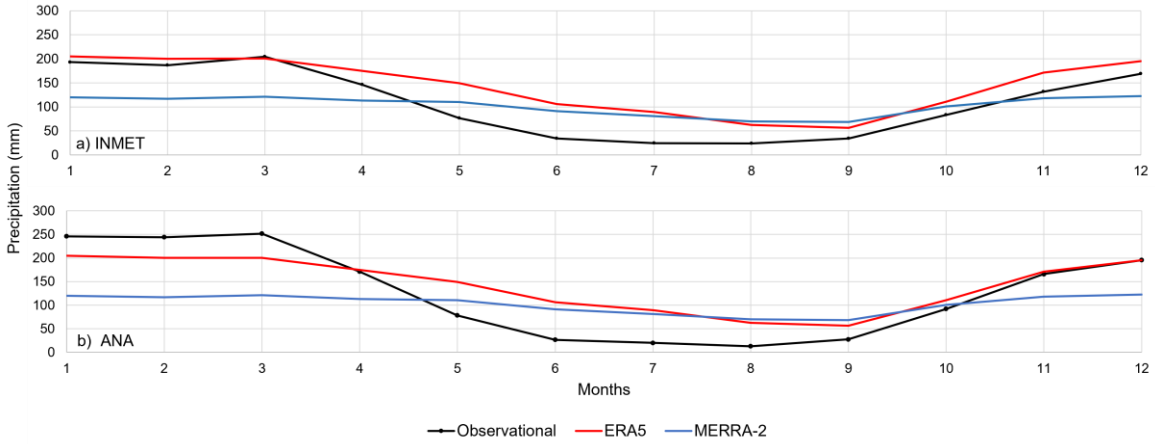


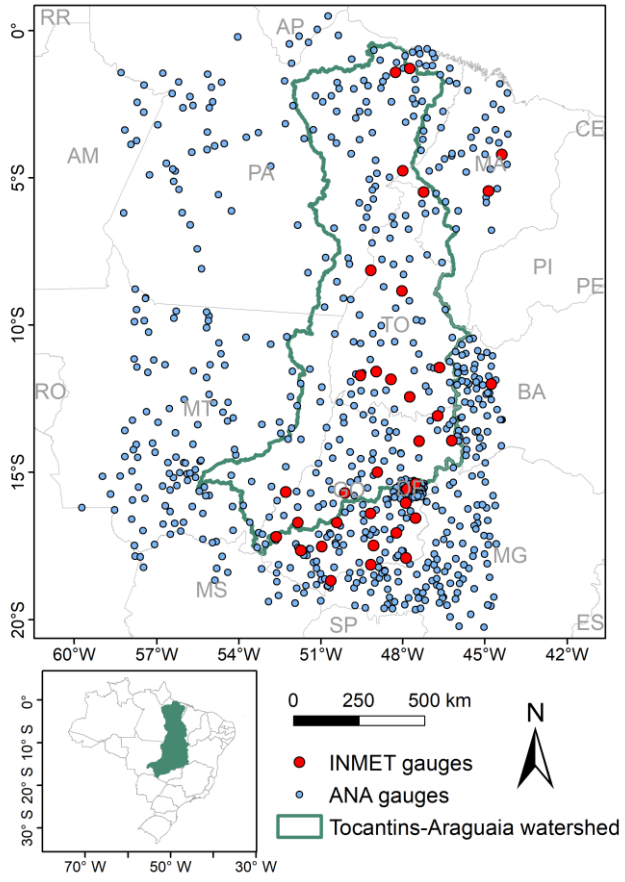
Future steps

- Run the simulations for a longer period
- Simulate the coupling in a 3D model, to evaluate impact in the baroclinic gradient
- Evaluate the residence time using Lagrangian model

Precipitation Evaluation

- 761 rain gauges
- Point-to-pixel and a Climatologial approach
- Statistical parameters: RMSE, NSE, R, R^2 and BIAS





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RESEARCH

Evaluation of precipitation products in a Brazilian watershed: Tocantins-Araguaia watershed case study

Débora R. Pereira[1,2] · Ana R. Oliveira[1] · Maurício S. Costa[2] · Tiago B. Ramos[1] · Marcelo Rollnic[2] · Ramiro J. J. Neves[1]

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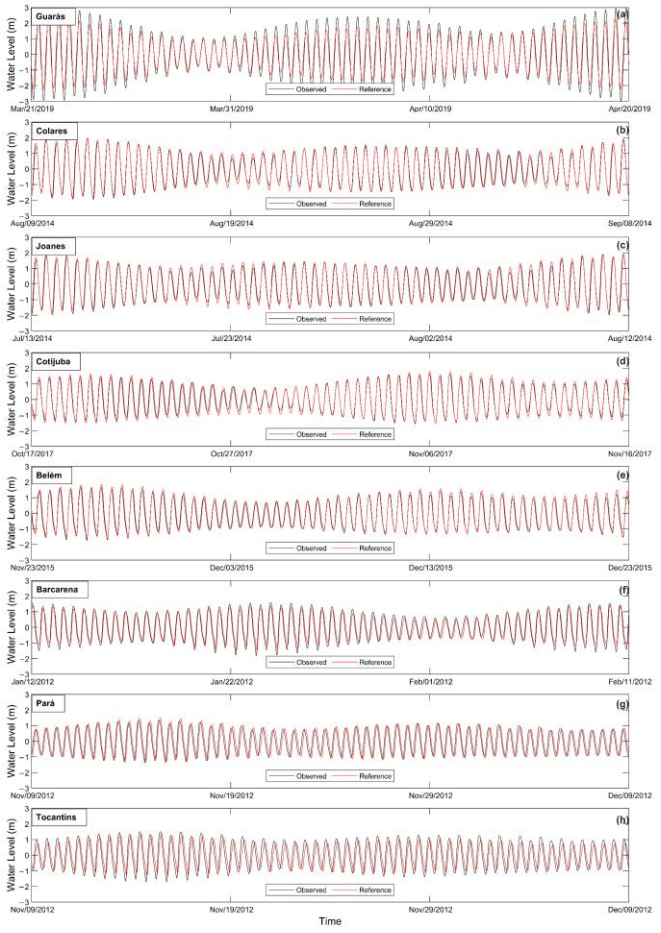
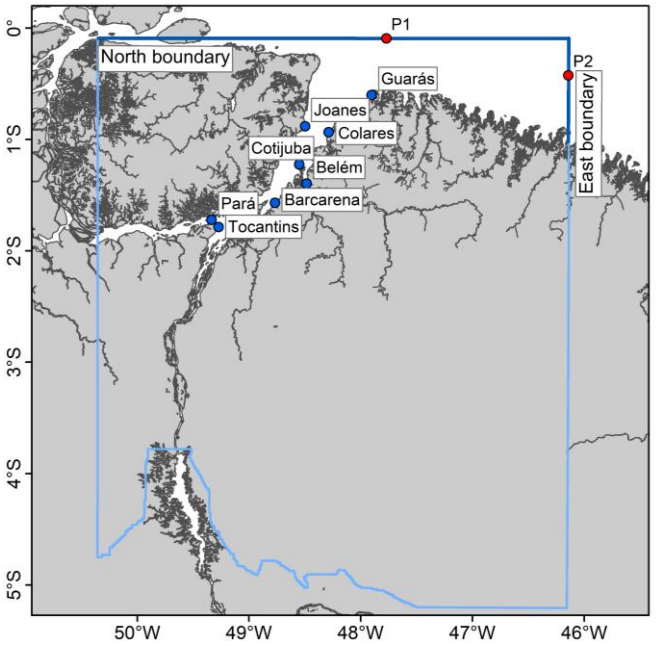
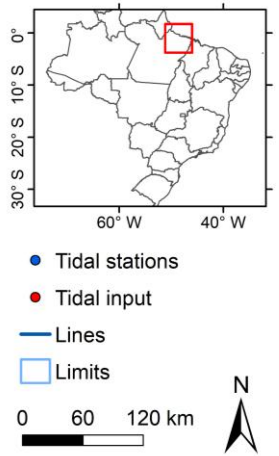
Tide behavior in a hydrological model?

- Despite advances in including tidal dynamics in hydrological models, no one explored nor evaluated the tidal behavior in hydrological models
- 8 tidal stations
- Statistical parameters: RMSE, NSE, R^2 and BIAS
- By incorporating tidal dynamics, MOHID-Land provides a more comprehensive understanding of the intricate interactions within estuarine and coastal systems







Simulation of Tidal Oscillations in the Pará River Estuary Using the MOHID-Land Hydrological Model

by Débora R. Pereira [1,*], Ana R. Oliveira [1], Mauricio S. Costa [2], Marcelo Rollnic [2] and Ramiro Neves [1]

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Beyond the articles

A influência do solo e da vegetação na modelação hidrológica de uma sub-bacia do Rio Araguaia no Cerrado Brasileiro

Debora R. Pereira Ana R. Oliveira Tiago B. Ramos Marcelo Rollnic Ramiro Neves

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Assessing The Capability Of A Hydrological Model For Simulating Macrotidal Elevations In Amazon Estuary

Debora R. Pereira Ana R. Oliveira Marcelo Rollnic Ramiro Neves

Conferência: AGU 2023

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Conferência: SPMAC2024

Thank you!

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