

Alterations in the thermo-haline structure and hydrodynamical circulation within the deltaic regions and continental platforms adjacent to the San Francisco and Parnaiba rivers (NE Brazil) due to the effects of global climate changes

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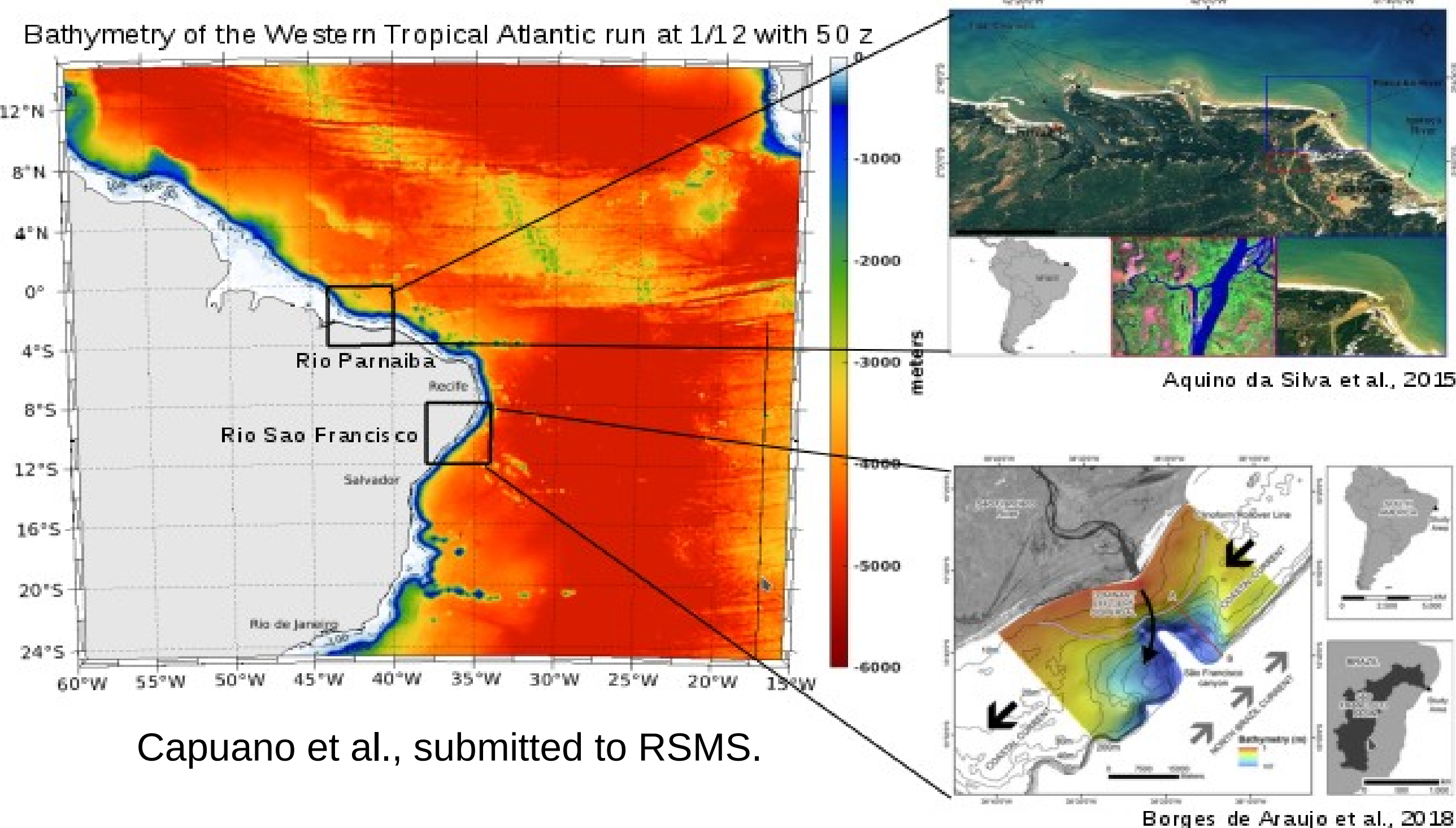
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Introduction: Study Regions & Motivation

- Large river, delta-front estuaries are key interfaces between continents and the oceans: the **Sao Francisco** & **Parnaiba** rivers;
- Their deltaic clinofoms are source of underestimated info on environmental changes= precious proxies!
- Focus on the hydro- and T-S dynamics of two major NE rivers to investigate modifications affecting the Brazilian Tropical Atlantic.

Scientific Questions:

- Identify & Analyse the variability scales of the physical properties;
- Qualify & quantify their seasonal and interannual cycles.

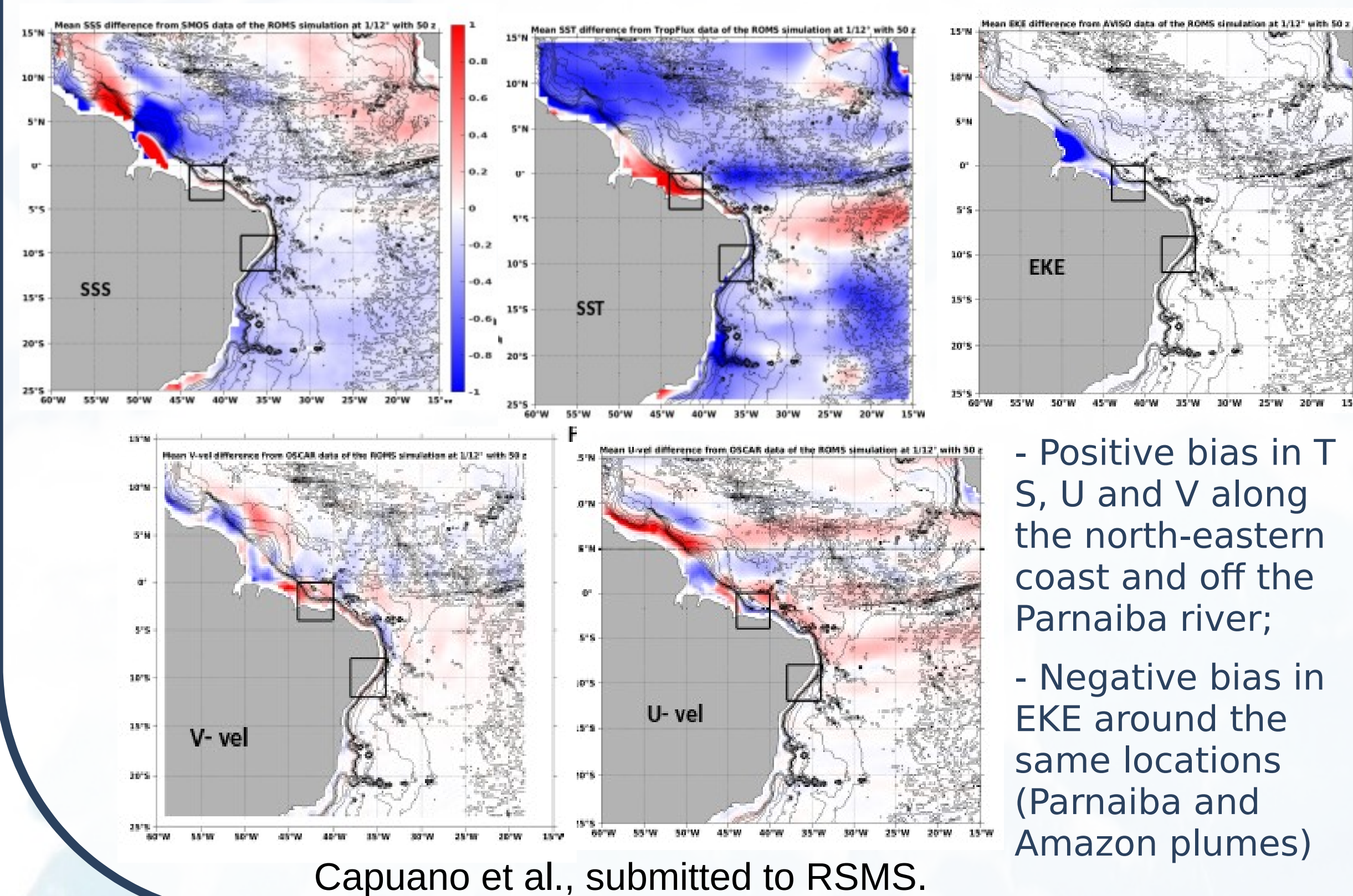


Methodology

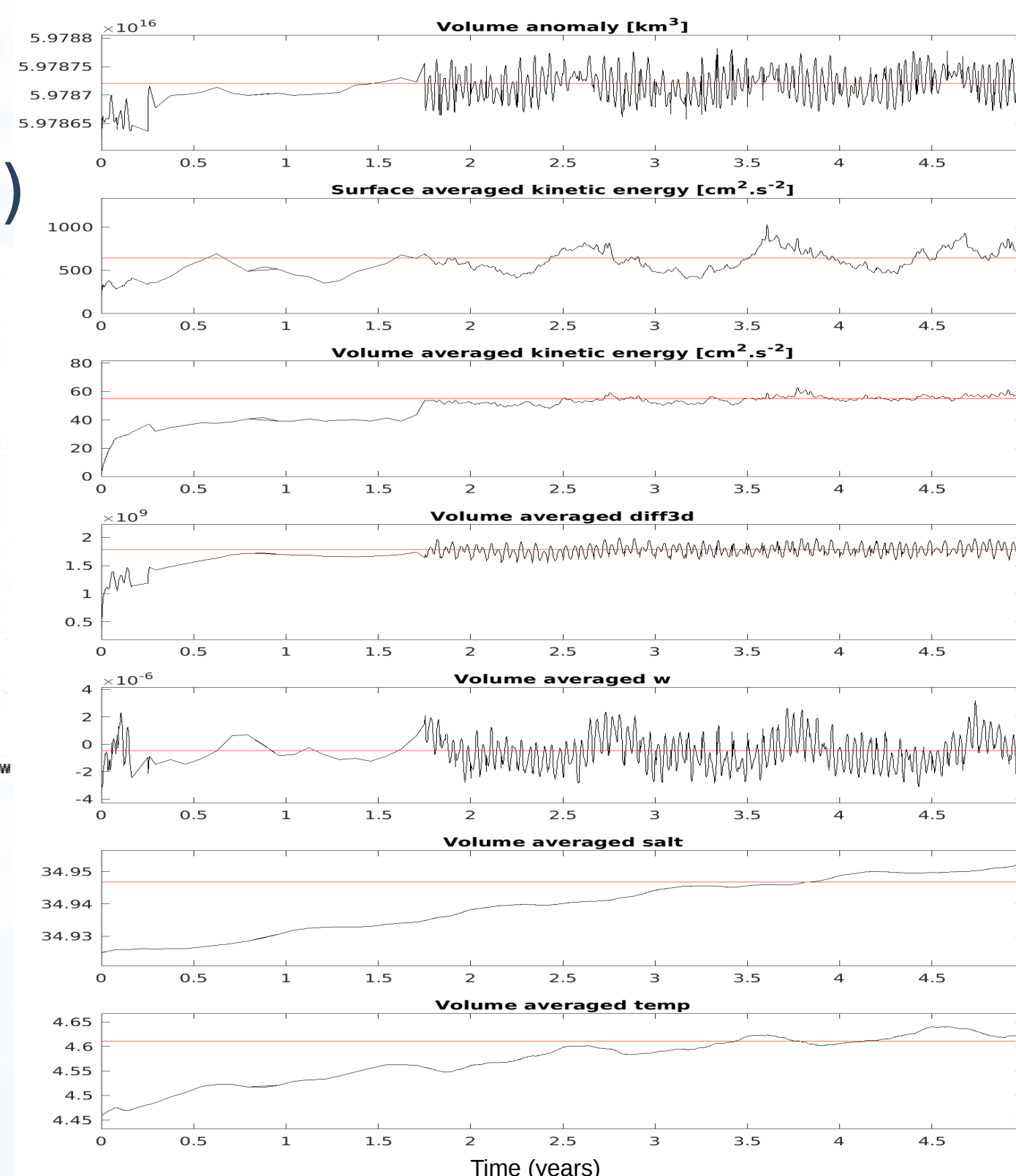
THE MODEL: run realistic numerical simulations of the ocean circulation in the Western Tropical Atlantic, using the Regional Ocean Model System (ROMS, see 'Shchepetkin & McWilliams, 2005'). 2 main setups (with tide & without):

- 1/12° with 50z, having climatologies for forcings, lateral & initial conditions;
- 2-way nested configuration, parent grid at 1/12° & 2 child domains at 1/36°.

OUTPUT VALIDATION: against satellite products (SMOS, TropFlux, AVISO, OSCAR... model data-obs)



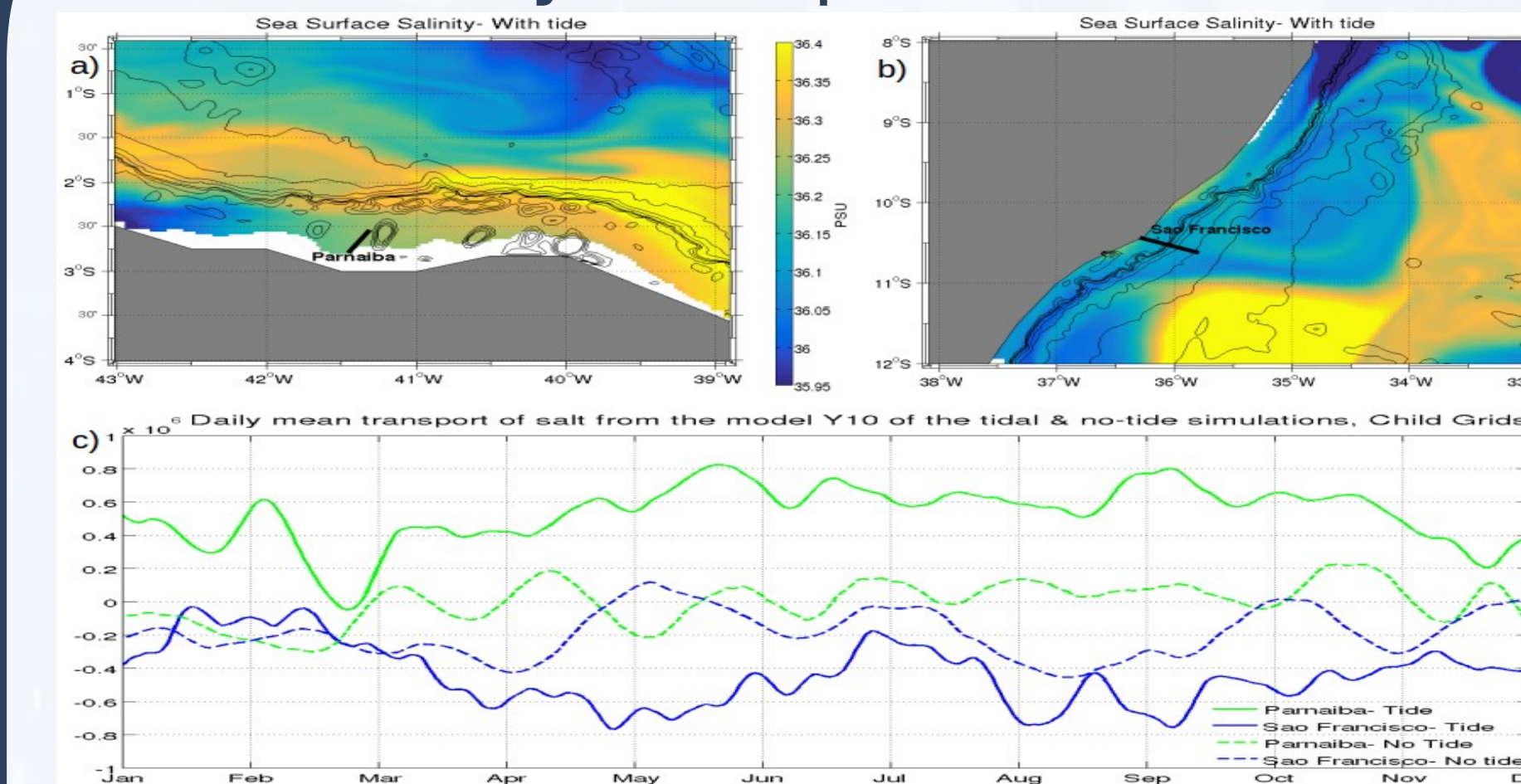
- Positive bias in T, S, U and V along the north-eastern coast and off the Parnaiba river;
- Negative bias in EKE around the same locations (Parnaiba and Amazon plumes)



SPIN-UP: Time series of the modeled diagnostic variables

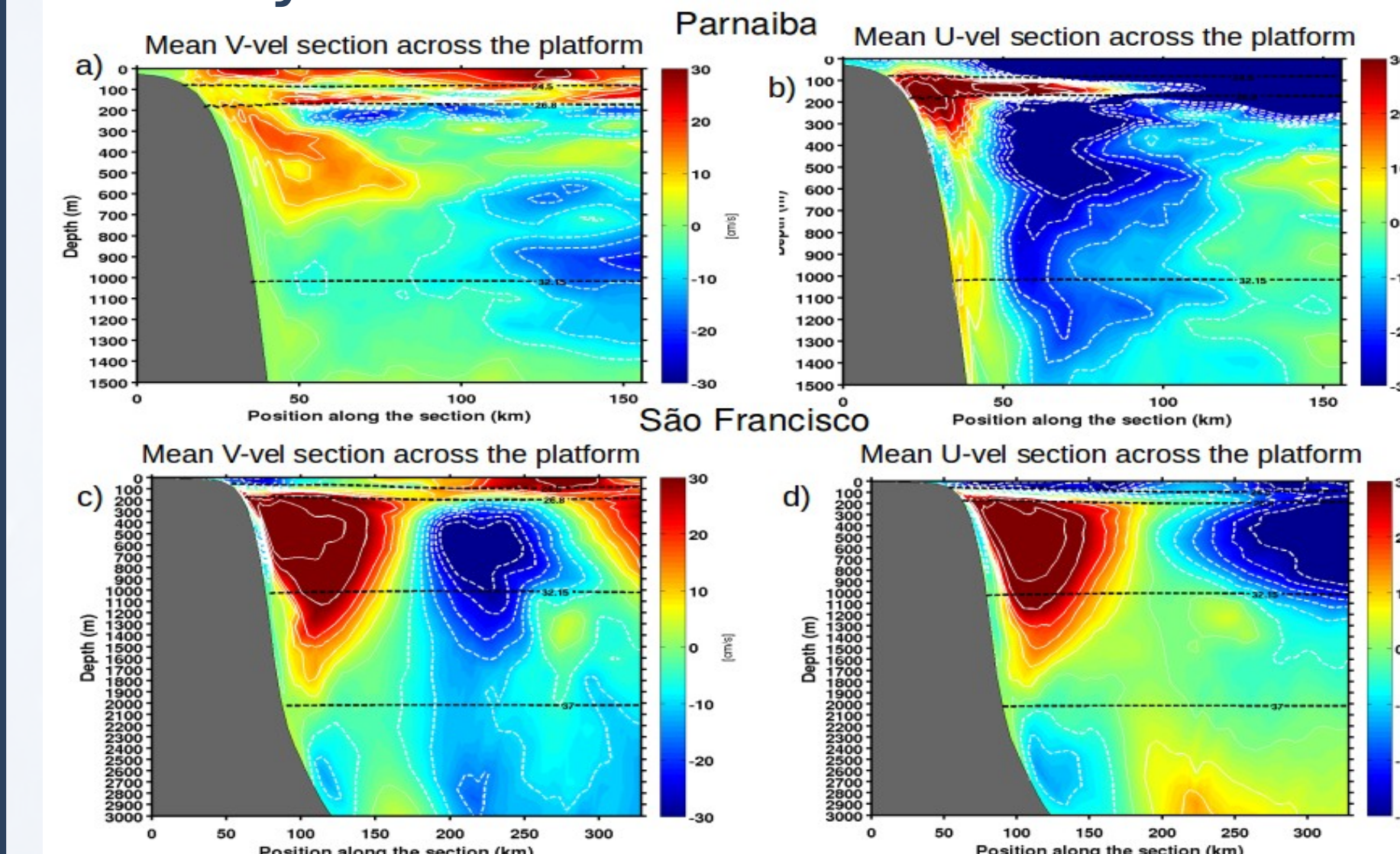
Preliminary Results

Mean Salinity Transports' Times Series

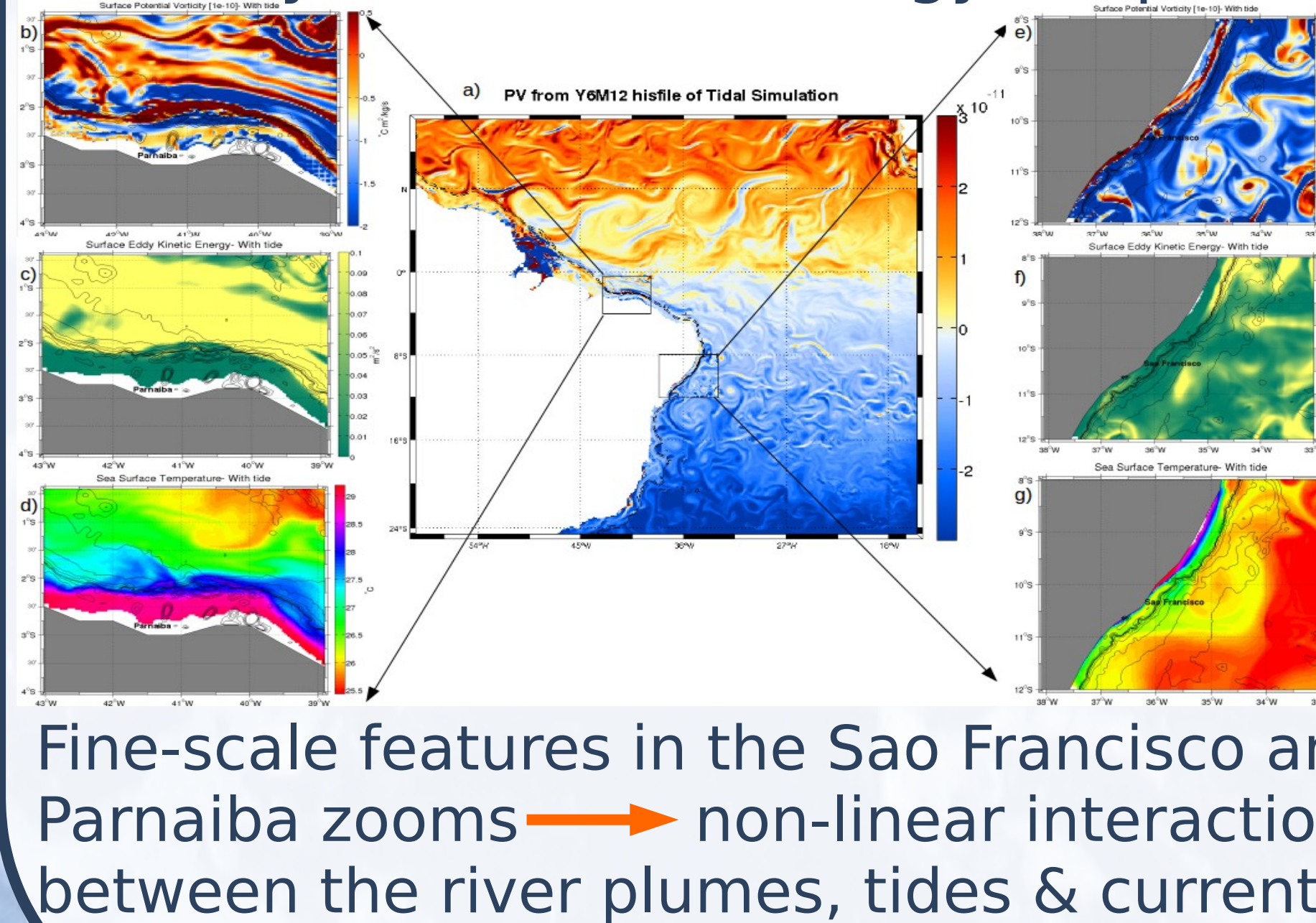


Tidal solution shows higher values for both deltas, being generally positive for the Sao Francisco and negative for the Parnaiba

Velocity Currents' Sections at the Shelf



Ces & Aces with important vertical structure Vorticity and Kinetic Energy snapshots

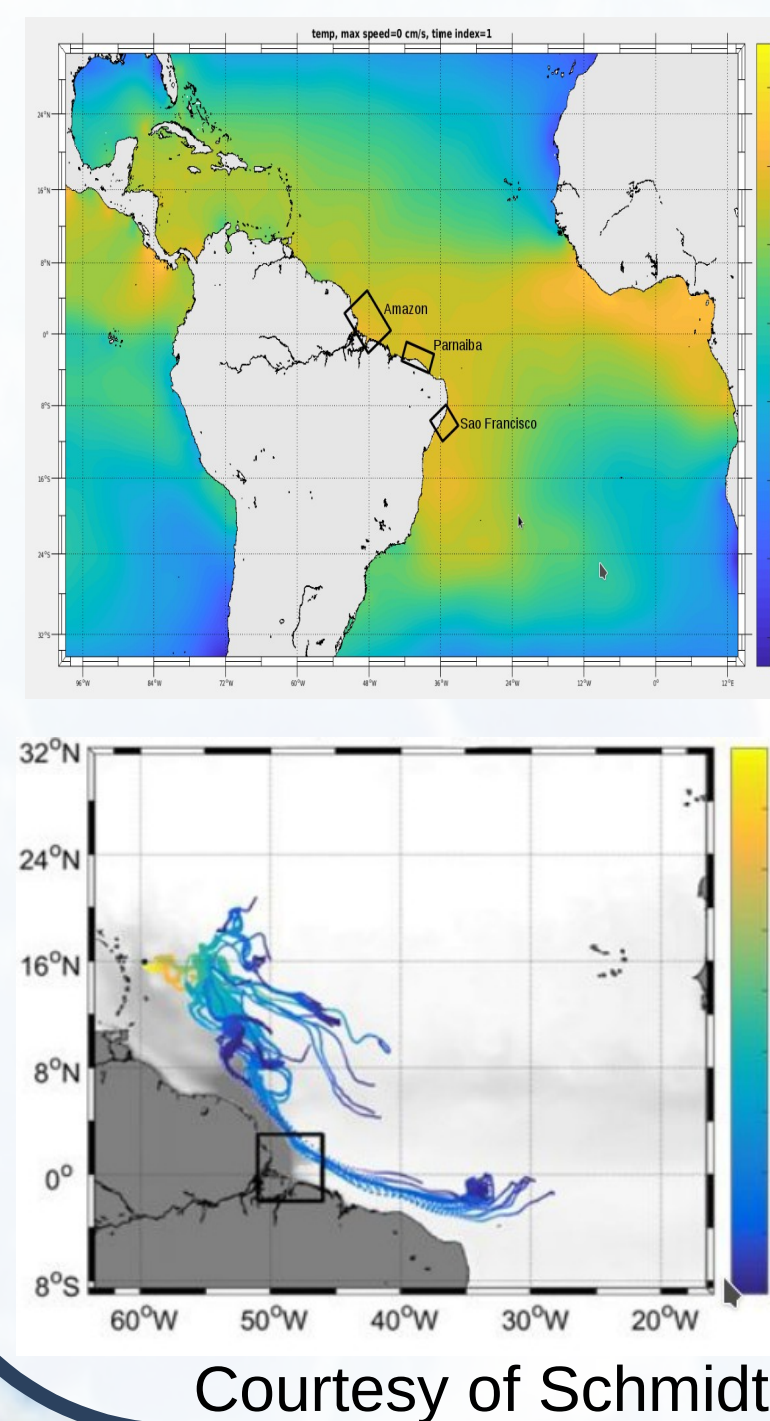


Fine-scale features in the Sao Francisco and Parnaiba zooms → non-linear interactions between the river plumes, tides & currents

Capuano et al., submitted to RSMS.

Next Steps

- ◆ Interannual run of the whole South-Atlantic, with realistic forcings, & boundary conditions from future projections (2050 and 2100) of the Coupled Model Inter-comparison Project 6
- ◆ Lagrangian offline tool for the tracking of microplastics within the estuaries



Conclusions

- ✓ ROMS= a reliable numerical tool to reproduce coastal-estuarine processes and their thermo-haline distribution;
- ✓ Short spatio-temporal scales of variability characterise circulation patterns, hydrodynamics and T-S structure offshore the two estuaries;
- ✓ Hints of subsurface-intensified eddies of both signs within the study areas;
- ✓ Across the shelf, off the deltas, strong turbulence at the surface & at depth: impact of the plumes + NBC rings?

References

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