River Deltas and Estuaries: the not-missing link.

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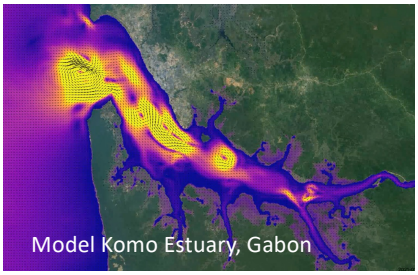
Representing an active interface between land and oceans, estuaries facilitate the transport of pollutants, sediments, and major nutrients such as carbon, from the terrestrial to the marine environment. We expect SWOT to further our understanding of these regions, globally, and to support modeling and quantification of export processes. However, estuaries and deltas are highly dynamic and spatially complex systems that present methodological challenges that must be addressed. Our goal is to advance SWOT capabilities in deltas and estuaries by developing relevant geographical databases, hydrodynamic models, and processing methods.

Implementing hydrodynamic numerical models over 48 river deltas and 3 estuaries (left): Goals: 1-Simulate SWOT; 2-Assimilate SWOT; 3-Estimate carbon, nutrient and sediment exchange; 4-assess coastal resilience and vulnerability; 5-support navigation, rescue and pollutant monitoring.



AirSWOT In Situ Science Validation Campaign St-Lawrence and Saguenay Estuaries: AirSWOT collected data in August 2023 coincident with in situ measurements of water level, wave buoys, HF radar in the Estuary* and water level and discharge in the Rivière Chaudière**. Six SWOT passes cover the St-Lawrence Estuary. Three SWOT passes were imaged simultaneously with AirSWOT. We will characterize signal given surface conditions and develop SWOT assimilation for model Cal/Val.

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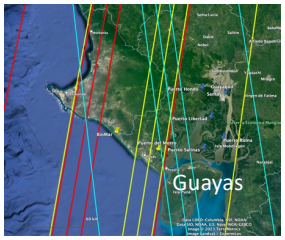
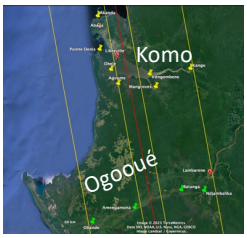
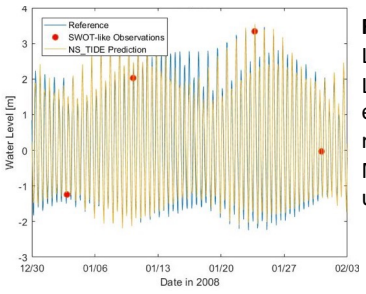
SWOT Science Cal/Val under 1-day orbit: Installed water level gauges in the A) Guayas Estuary, Ecuador B) Komo Estuary, Gabon and C) St-Lawrence and Saguenay Estuaries.

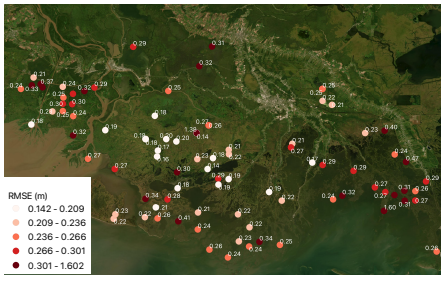




PT install, ADCP transects



Resolving tide and river discharges:
Left: Example with 2D SWOT samples in the St. Lawrence Estuary. Using the NS_Tides algorithm (Matte et al. 2013) assuming stationary tides 1-year SWOT record. Right: We are currently testing NS_Tides in the Mississippi River Delta. Left: water level prediction uncertainty in MRD.



To do: Assimilate SWOT data into new Global River Delta network developed for detlas and estuaries shown above. Evaluate SWOT accuracy of water surface elevation and slope in the St-Lawrence, Saguenay, Komo and Guayas estuaries, as well as within the Mississippi River Deltas and wherever in situ measurements are available. Investigate and mitigate impact of plant seasonal phenology and river discharge variability in coastal wetlands. Develop an approach based on SWOT data and NS_Tides to calibrate and validate hydrodynamic models in river deltas and Estuaries.