



Oceanic Salt Intrusion into Tidal Freshwater Rivers

2025 Annual Meeting of the Scientific Committee on Oceanic Research

28-31 October 2025 Santa Marta, Colombia

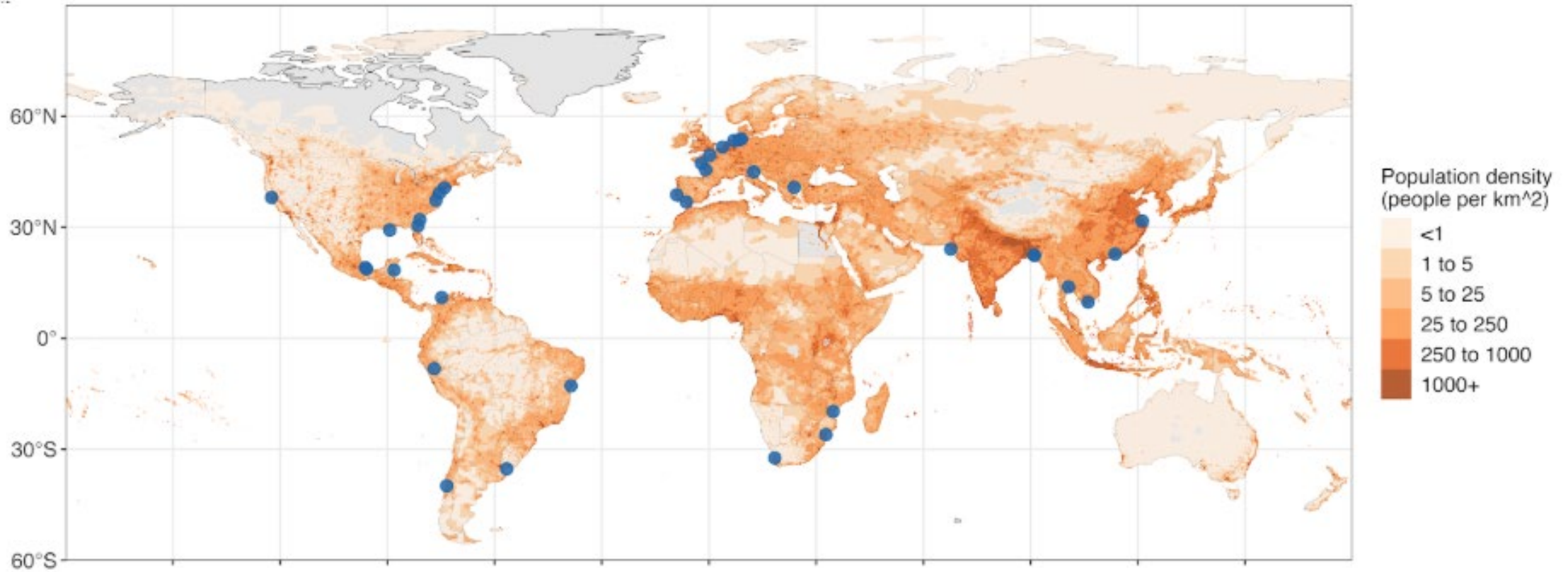


SCOR Working Group 172

Oceanic Salt Intrusion into Tidal Freshwater Rivers (SALTWATER)

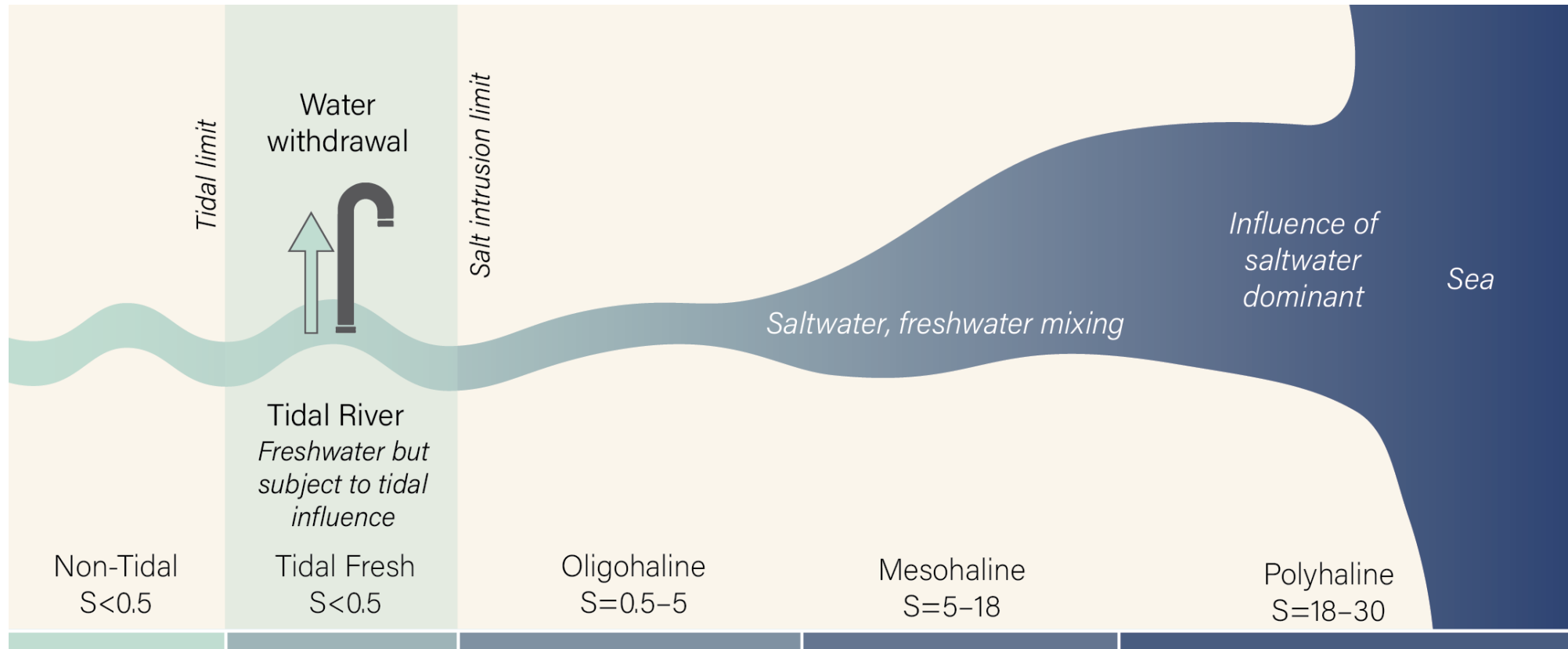


The Emerging Global Threat of Salt Contamination of Water Supplies in Tidal Rivers



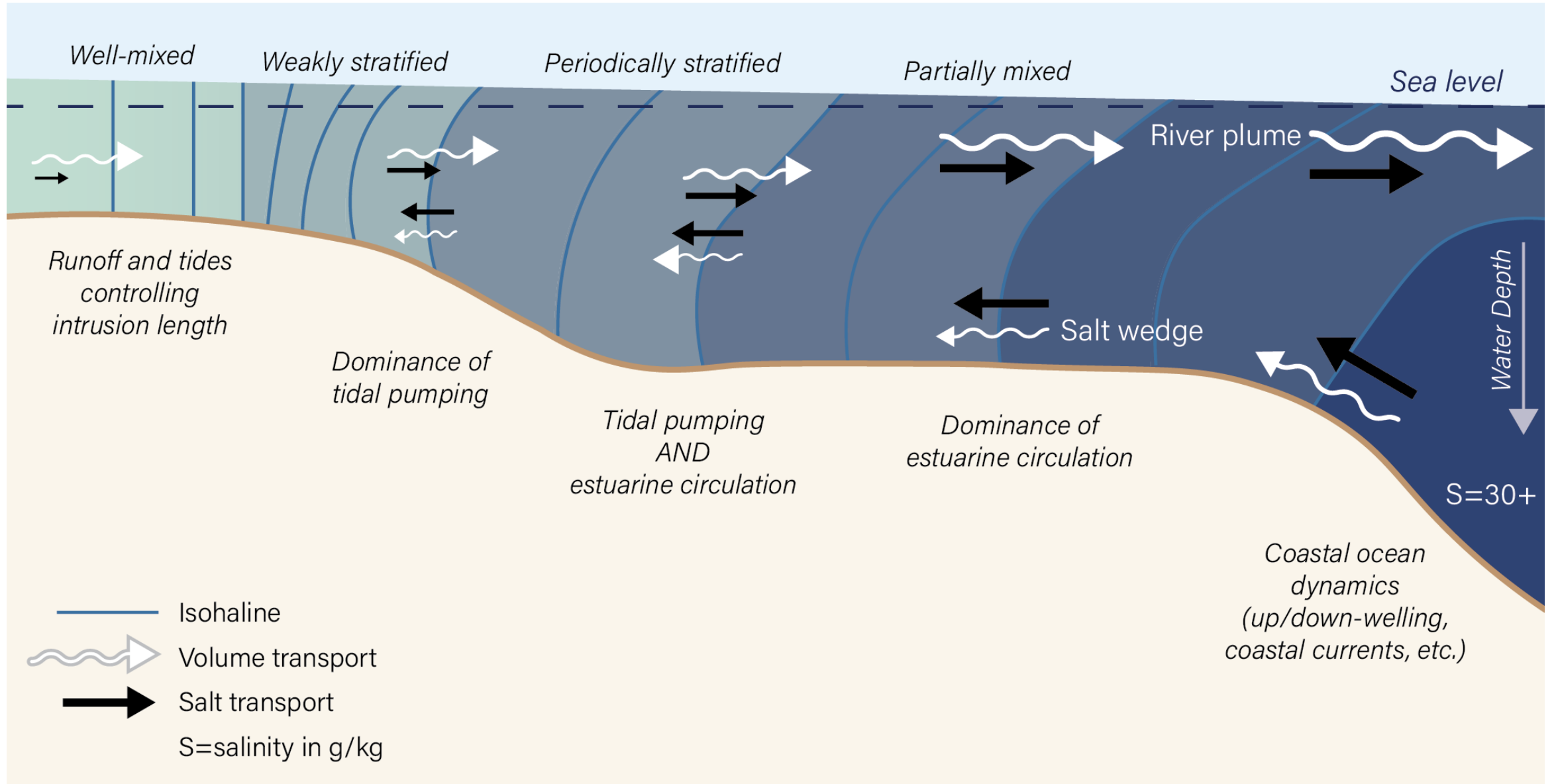
Li et al. (2025, invited global perspective in ES&T Lett.)

Tidal rivers at the intersection between hydrology and oceanography

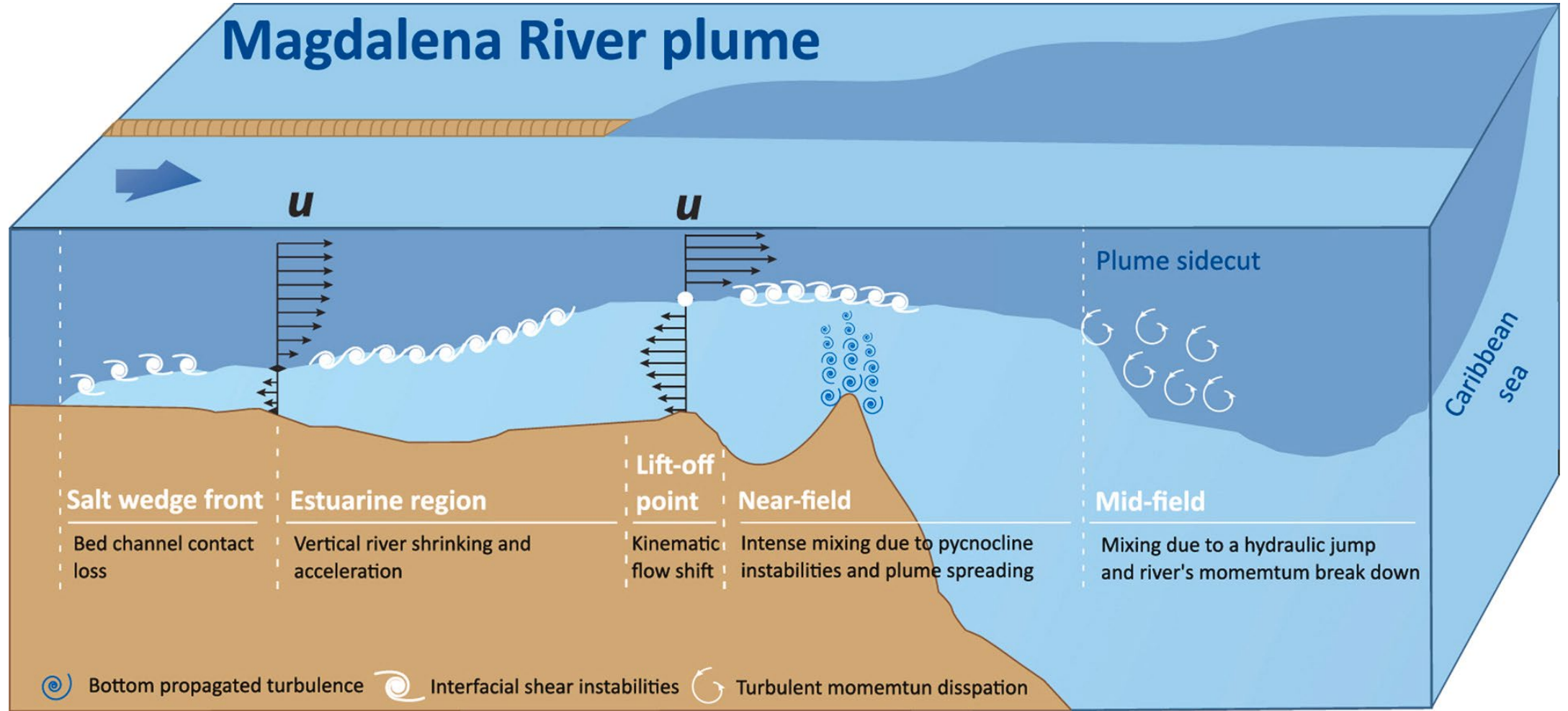


- ✓ Many water intakes (e.g. drinking water and agricultural irrigation) are located in tidal fresh rivers.
- ✓ Hydrologists do not typically consider tides (and rarely salts) in their models.
- ✓ Oceanographers treat rivers as an inflow with zero salinity.

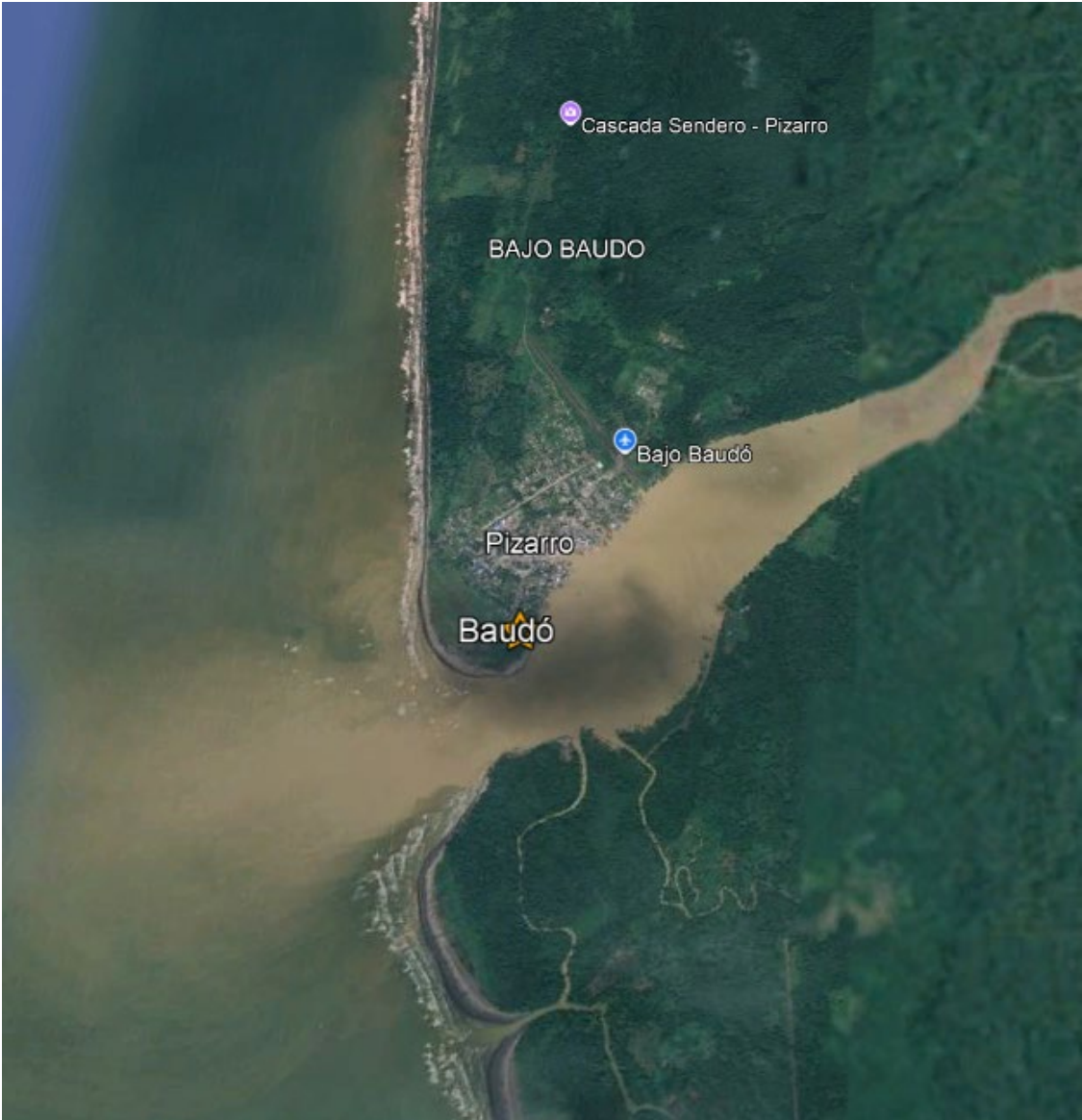
Physical processes transporting oceanic salt to estuaries



Salinity and Mixing Dynamics



Natural and intervened systems



Estuarine and oceanic processes affecting salt intrusion

What do we know?

- River flow changes
- Water depth changes due to channel dredging and sea-level rise
- Tides

$$L \sim Q^{-n} H^m U_t^{\pm p}$$

What might be important?

- Changing hydrological regimes, including prolonged drought and flash drought
- Regional sea level rise, changing ocean circulation, and sea level fluctuations
- Extreme weather, including extreme drought and storm surge

Terms of References

- **ToR1** Conduct a **comparative analysis** of selected case studies on the **salt intrusion** into estuaries and tidal rivers, gain a better understanding of the coastal and open-ocean **processes** that influence the salt intrusion, and identify **gaps in knowledge** and priorities for future research.
- **ToR2** Synthesize **existing modeling studies** of estuaries and tidal rivers, conduct model inter-comparison studies, and produce a best practice **manual for model configurations** such as grid resolutions and mixing/dispersion parameterizations.
- **ToR3** Analyze **chemical composition of riverine/oceanic water** mixtures using a global database of river chemistry and the data collected by the WG members. **Develop an improved equation of state** for the riverine-seawater mixture.

Terms of References

- **ToR4** Conduct data analysis to **identify conditions** conducive to **enhanced salt intrusion** in different types of estuaries by leveraging site-specific studies conducted by the SCOR WG members and their collaborators. Build a Github for sharing the data analysis programs.
- **ToR5** Develop a **global synthesis of oceanic salt intrusion** into estuaries and tidal rivers and discern the roles of river flows, sea-level rise, regional sea level fluctuations, changes in tides, and winds in driving extreme salt intrusion and salt contamination of water supplies.
- **ToR6 Build capacity**, share knowledge and transfer technical skills, particularly to scientists in developing nations.

Current Activities



Monthly virtual meetings for the entire WG and subgroups:

- **Subgroup 1** - *Intercomparison of Saltwater Intrusion Processes in Estuaries* (**SG1**, lead: Debora Bellafiore)
- **Subgroup 2** - *Remote effects on Saltwater Intrusion in Estuaries* (**SG2**, lead: Charita Pattiaratchi)
- **Subgroup 3** – *Salt Ion Composition in Riverine-Oceanic Mixture in Tidal Rivers* (**SG3**, lead Rich Pawlowicz).

2025 Annual Meeting (13-14 June)

Harvard University
Hosted by Prof. Fiamma Straneo

- In-person participants: 8 WG members plus 7 guests
- Virtual participants: 6 WG members
- 23 talks and 2 group discussions



Current Activities



CP33B - Marine and Hydrological Processes Impacting on Estuarine Saltwater Intrusions | eLightning

Hans Burchard, Leibniz Institute for Baltic Sea Research Warnemünde, Rostock, Germany, **Debora Bellafiore**, Istituto di Scienze Marine (CNR-ISMAR), Venice, Italy, **Yuley M Cardona**, Universidad Nacional de Colombia, Medellin, Medellin, Colombia and **Ming Li**, University of Maryland Center for Environmental Science Horn Point Laboratory, Cambridge, United States



📅 Wednesday, 25 February 2026

🕒 14:00 - 15:30

📍 Hall 4, eLightning Theater 2 (SEC)



We are an international team of experts discussing salt intrusion research from around the world.

Our goal is to develop a global synthesis of this emerging topic, discern the roles of global climate change and local oceanic processes, and develop tools for observing, modeling and analyzing salt intrusion into tidal rivers.

Our **MISSION**

SCOR WG172 website - <https://scor-saltwater.net/>