Advancing Storm Surge Modelling in the northern Indian Ocean

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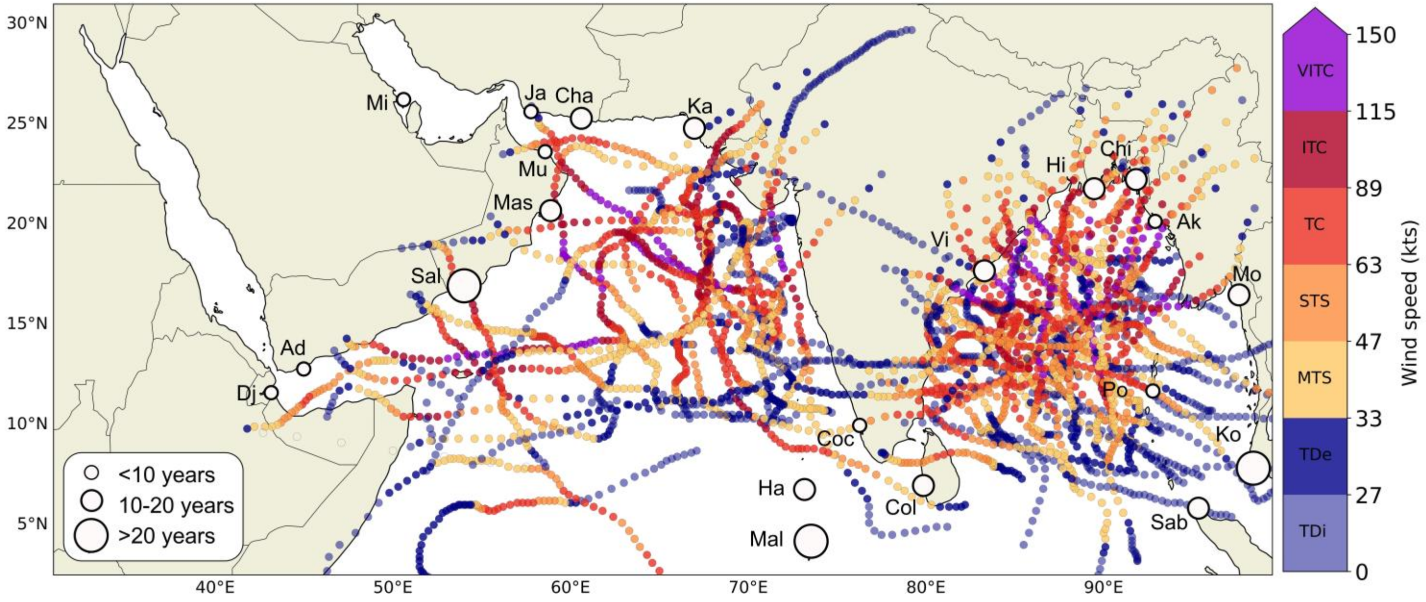
MOTIVATION

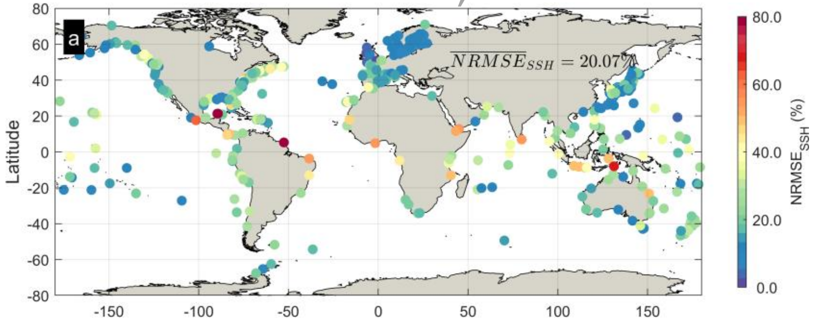
- Northern Indian Ocean experiences intense tropical cyclones and associated storm surges *(Khan et al., 2022, Leijnse et al., 2022, Sreeraj et al., 2022, Blakely et al., 2025)*

- Tide gauge records are scarce, often short in duration, and sometimes missing, highlighting the need for ocean modelling *(Haigh et al., 2023)*

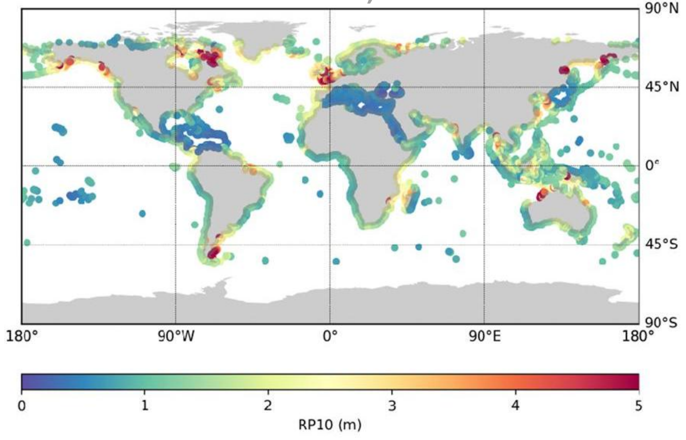
- Existing global storm surge databases using 2-D barotropic models :



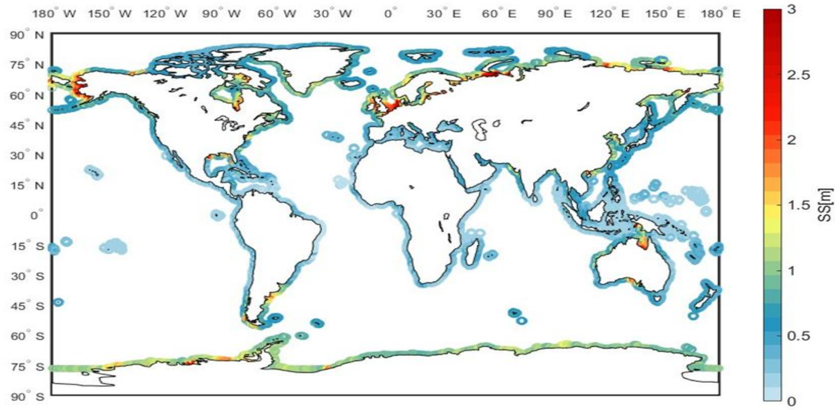
Mentaschi et al., 2023



Muis et al., 2020



Elsy Ticse et al., — Waves (Presentation, Tuesday 23 Sept. 2025)



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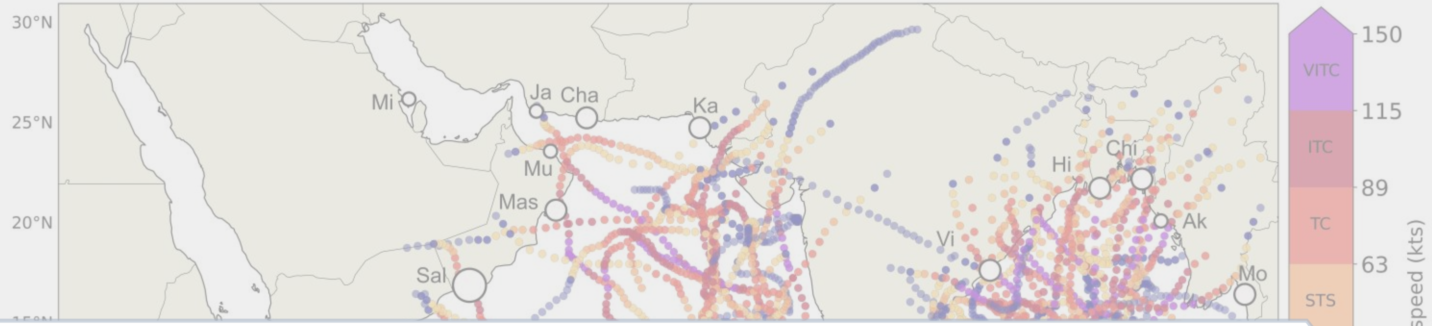
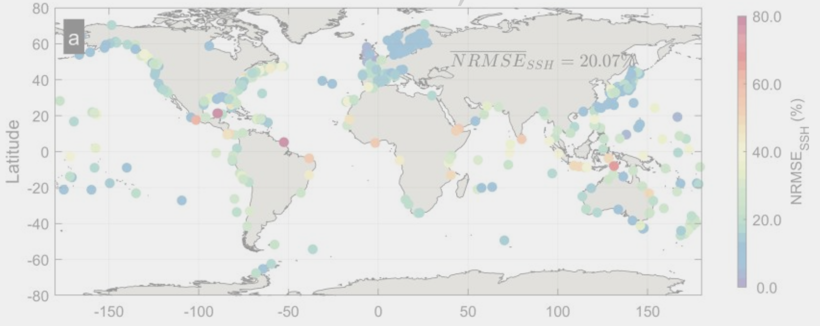


QUESTION:

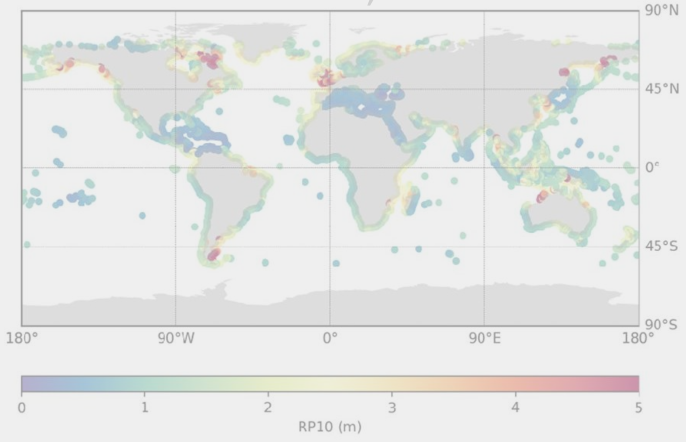
Importance of baroclinic dynamics for storm surge modelling in the northern Indian Ocean ?

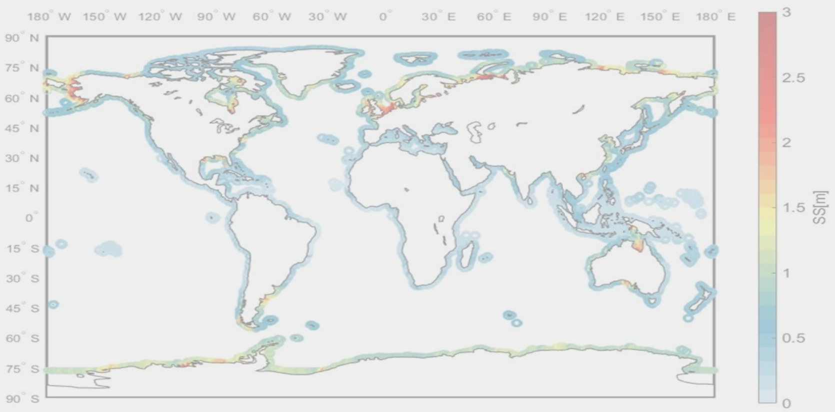
- Existing global storm surge databases using 2-D barotropic models :

Mentaschi et al., 2023



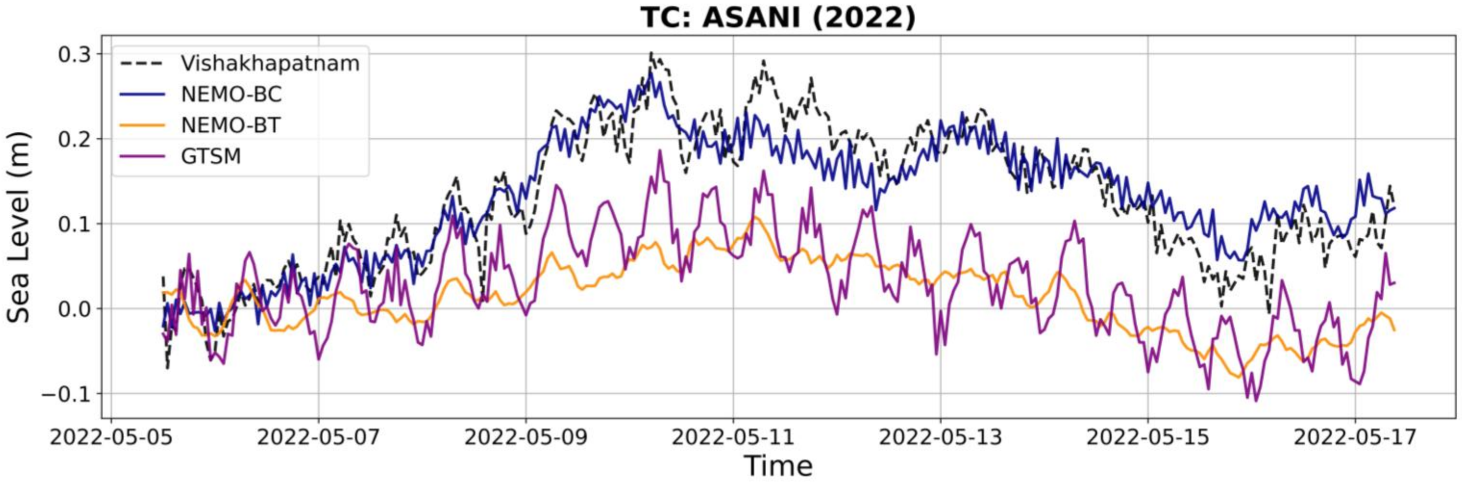
Muis et al., 2020

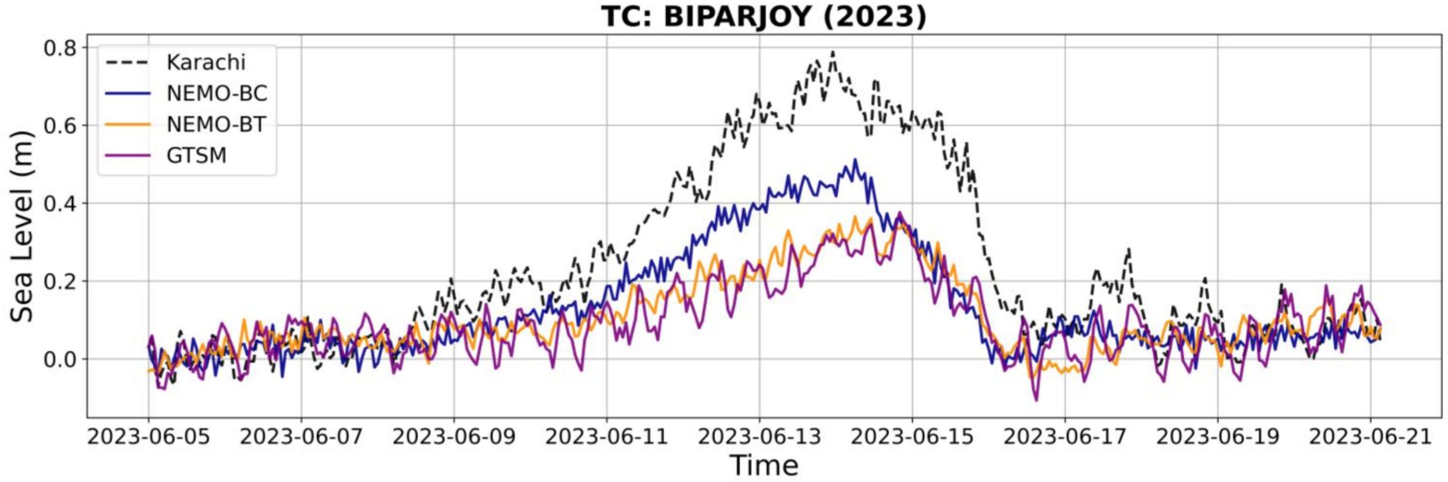


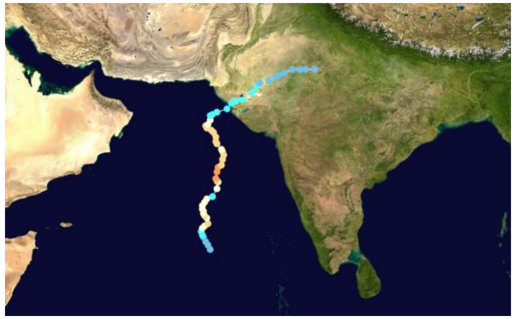


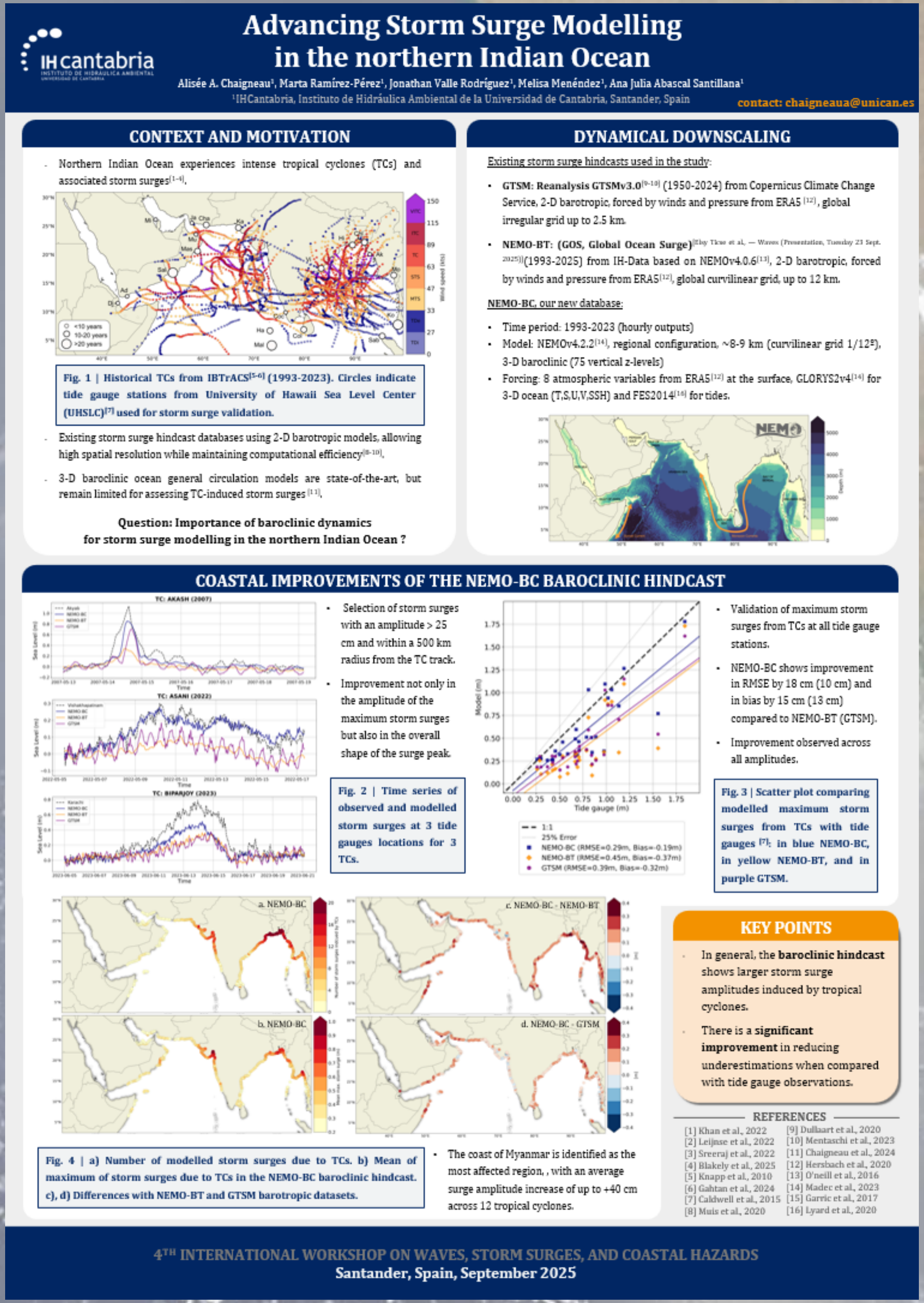
NEW REGIONAL 3-D BAROCLINIC DATABASE FOR THE NORTHERN INDIAN OCEAN

- Time period: 1993-2023
- Model/configuration: NEMOv4.2, ~8-9 km, 75 vertical levels
- Forcings: ERA5 for atm., GLORYS2v4 for 3-D ocean, and FES2014 for tides
- Hourly sea level outputs including: storm surges, tides, mean sea level









COME AT THE POSTER SESSION !!

+ validation against tide gauges

+ impact for all simulated tropical cyclones

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