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Assessing hydrodynamic processes of nearshore coral reefs

Numerical modeling and field observations around the island of Curaçao

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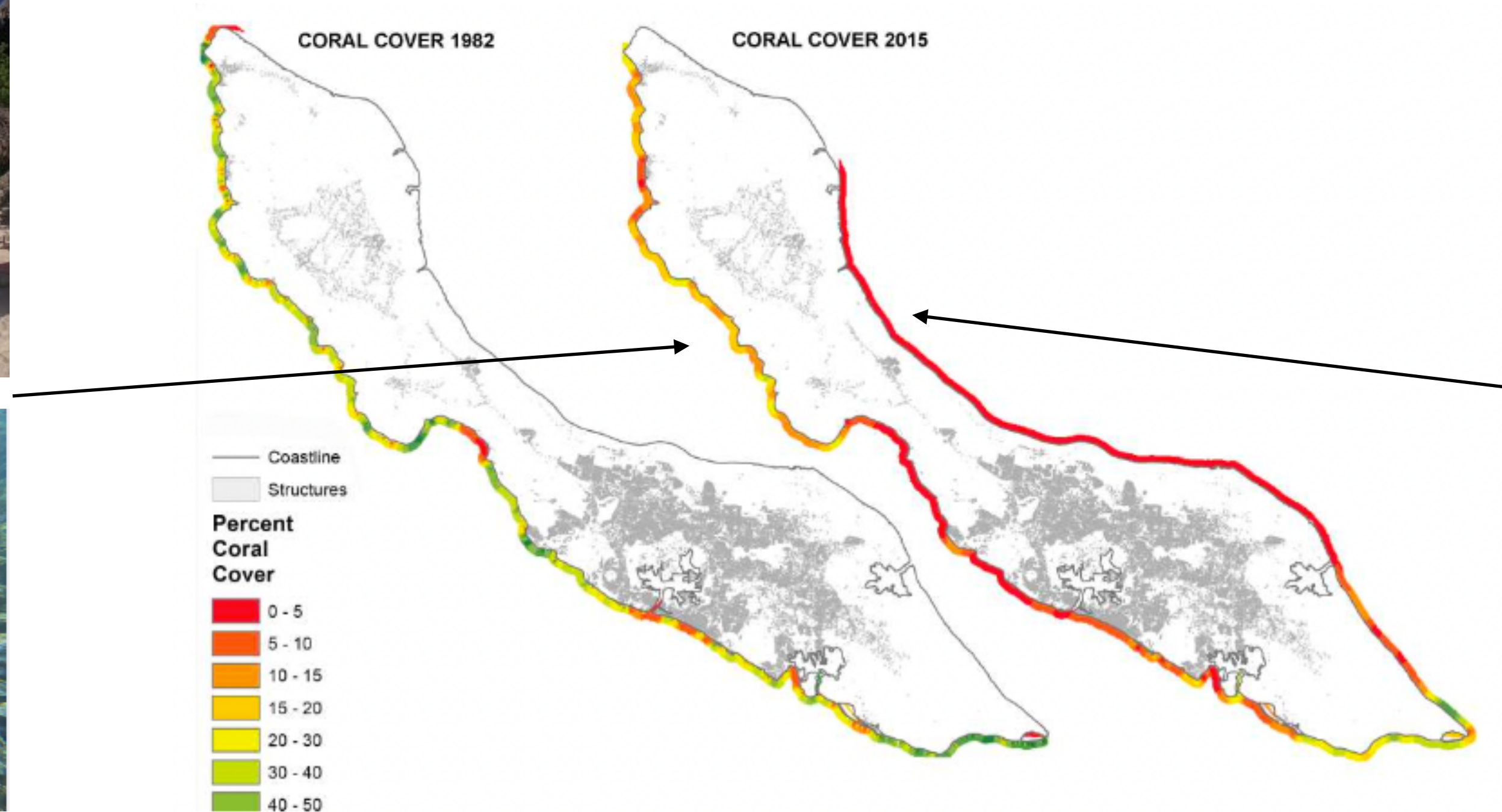
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Caribbean Sea

Venezuela



The influence of land on the state of coral reefs on Curaçao



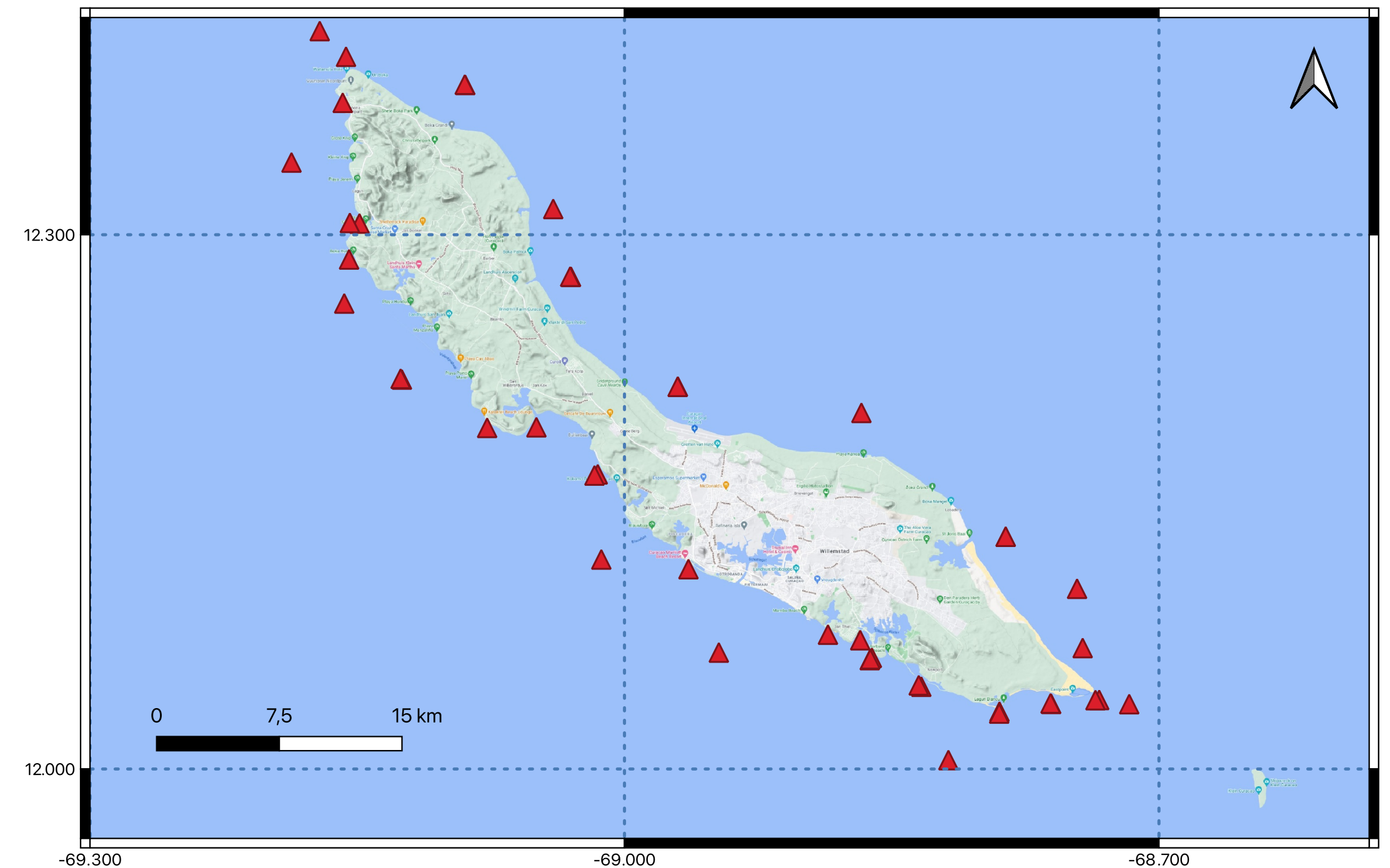
Curaçao has lost over 50% of its living coral between 1982 and 2015 (Waite institute, 2017).¹

Read more about the SEALINK project on www.sealinkcaribbean.net

Fieldwork: from deep sea...

- Expedition with **RV Pelagia**: two weeks in April 2022
- Collecting data: CTD, ADCP, Niskin bottles, Multibeam, Landers, cameras, sediment cores

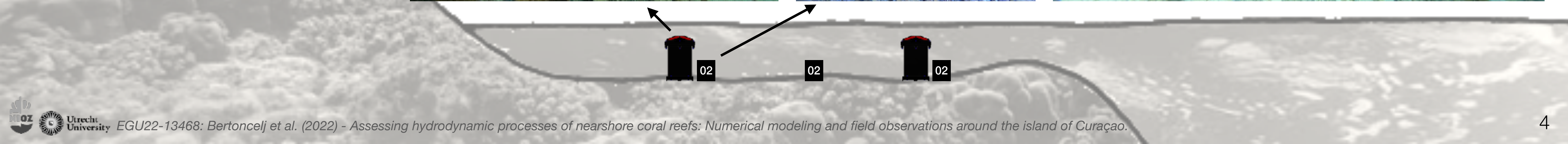
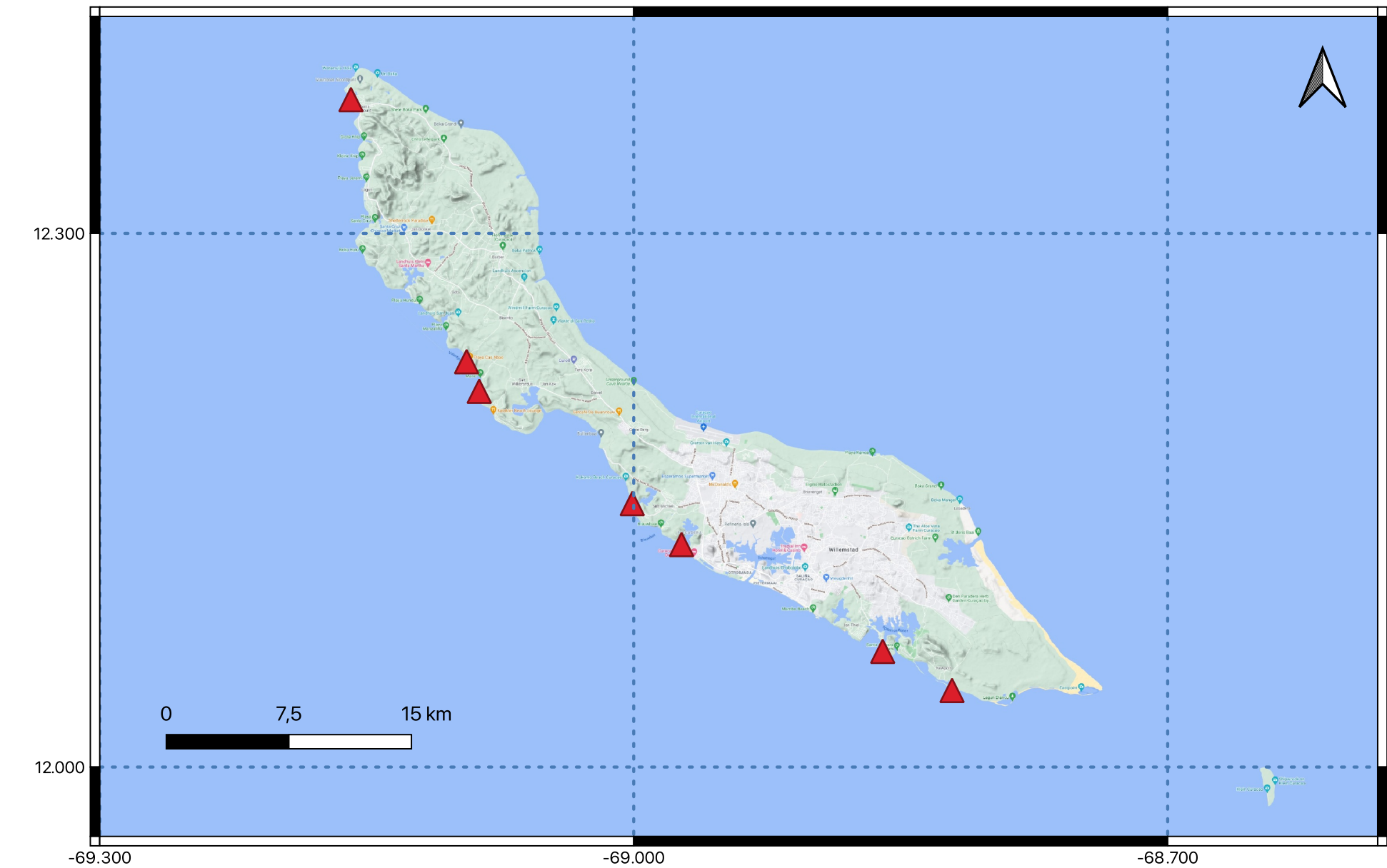
RV Pelagia 64PE500 – CTD and ADCP measurement locations, April 2022



...to nearshore coral reefs

- Observations of **currents, waves and turbulence** with Nortek Signature1000 ADCP sensors
- Observations of **oxygen** data with MiniDOT sensors
- Cross-shore and along-shore setting
- Up to 6h of continuous data

ADCP measurement locations: Curacao, March 2022



What hydrodynamical processes are important in transporting the substances from land towards the reefs and potentially **influencing the state of the coral reefs?**

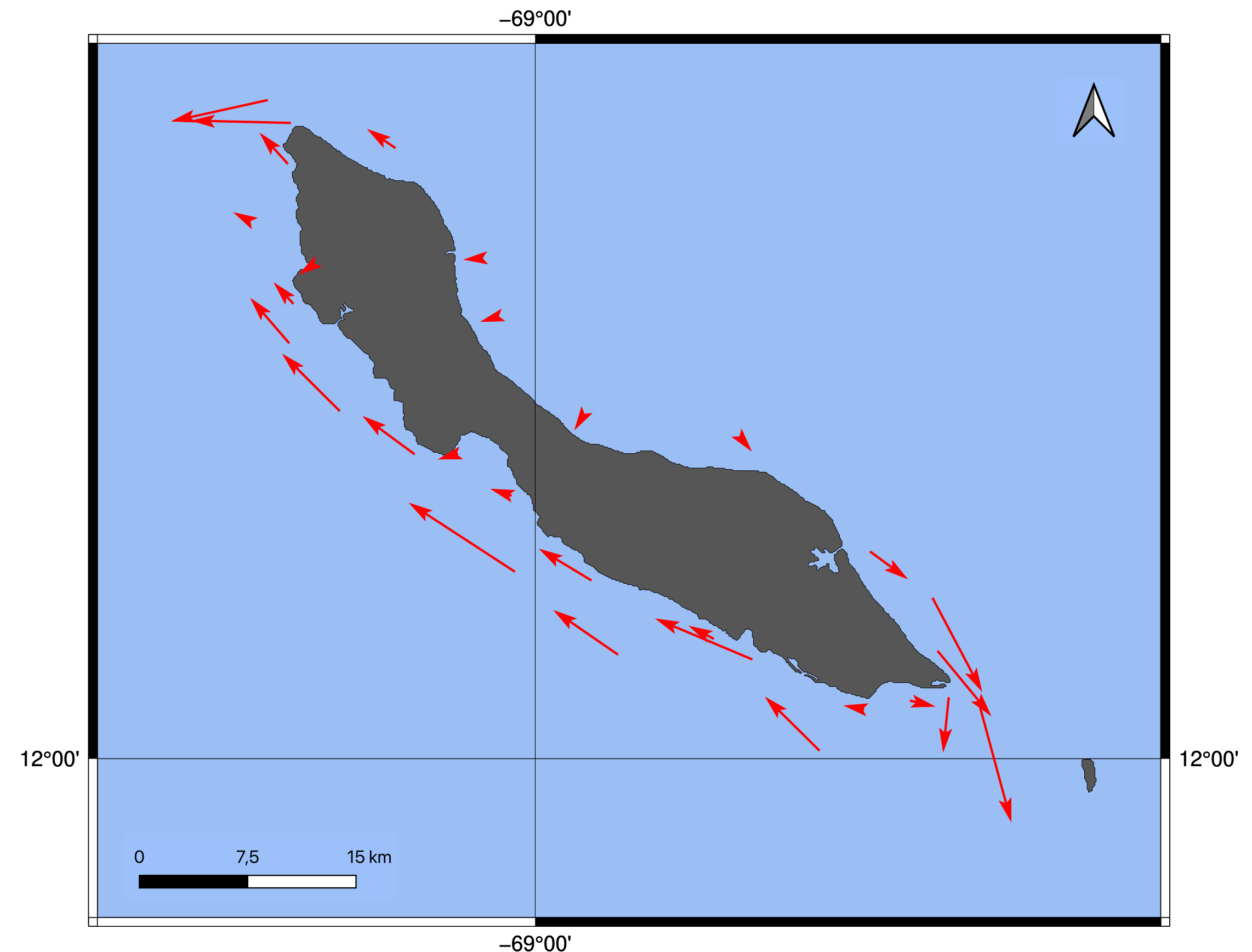


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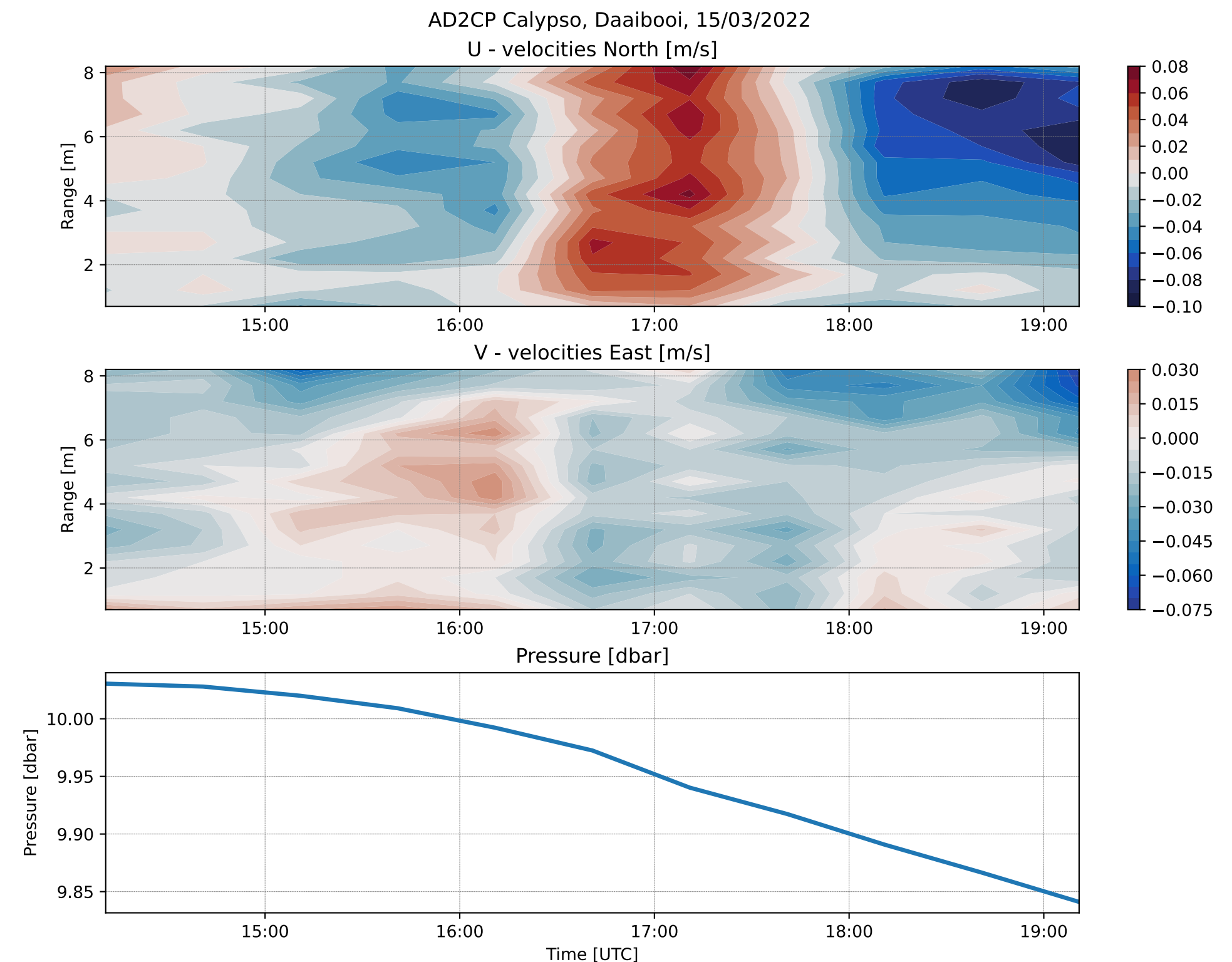
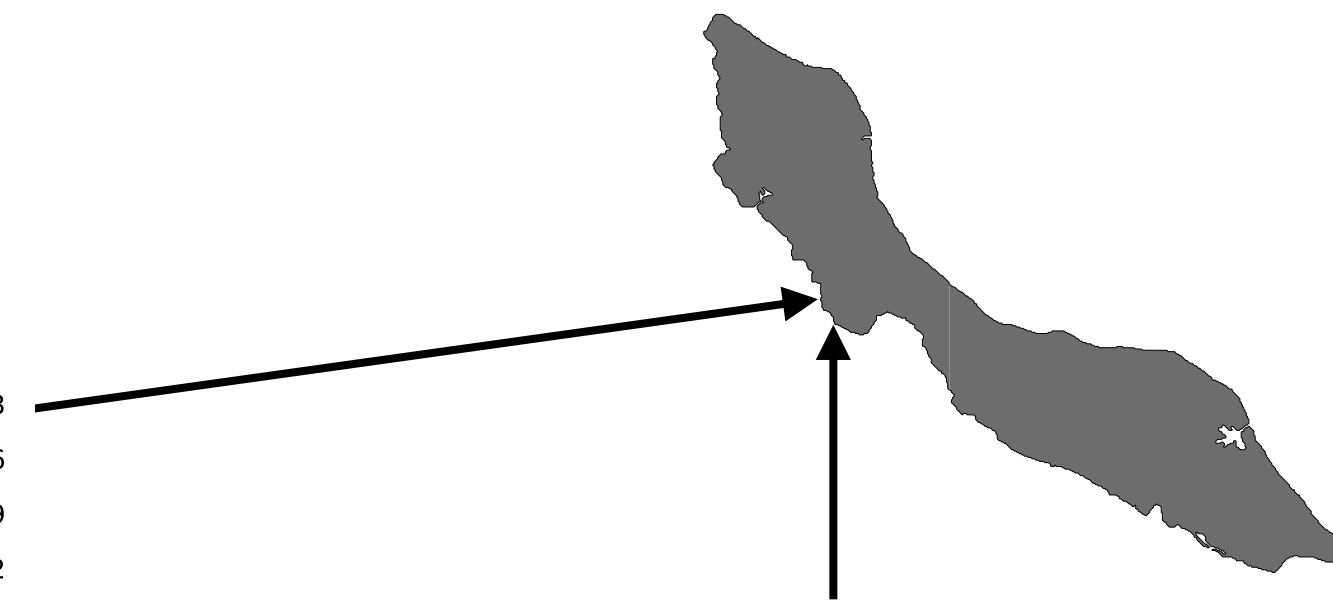
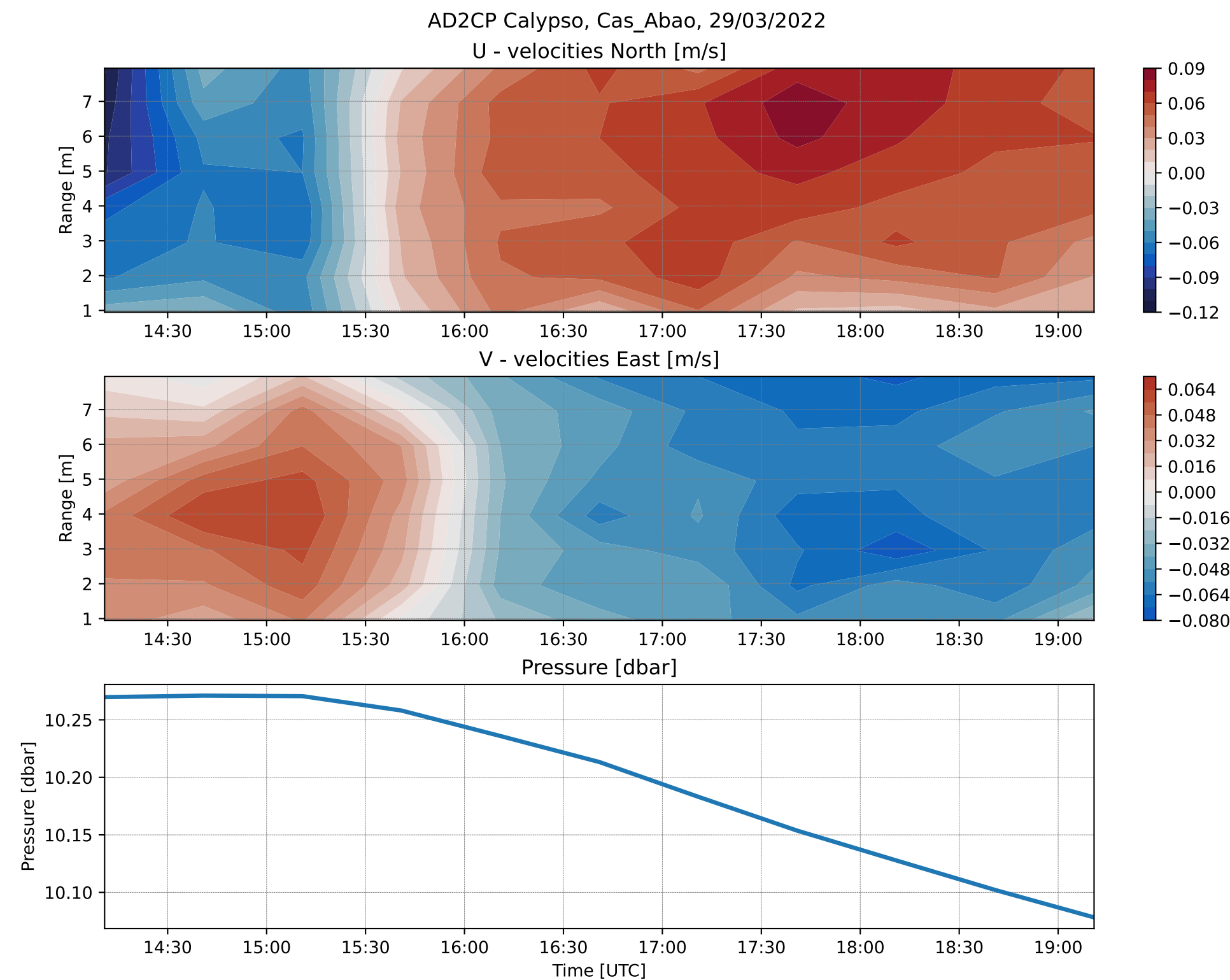


Large-scale circulation: observations from RV Pelagia

- Robust estimates of **current velocities at 50 m depth**, measured with vessel-mounted ADCP instrument
- **Three different characteristics** identified (Southern coastline, Northern coastline, East+West points)
- **East point:** known for exceptionally healthy coral reefs

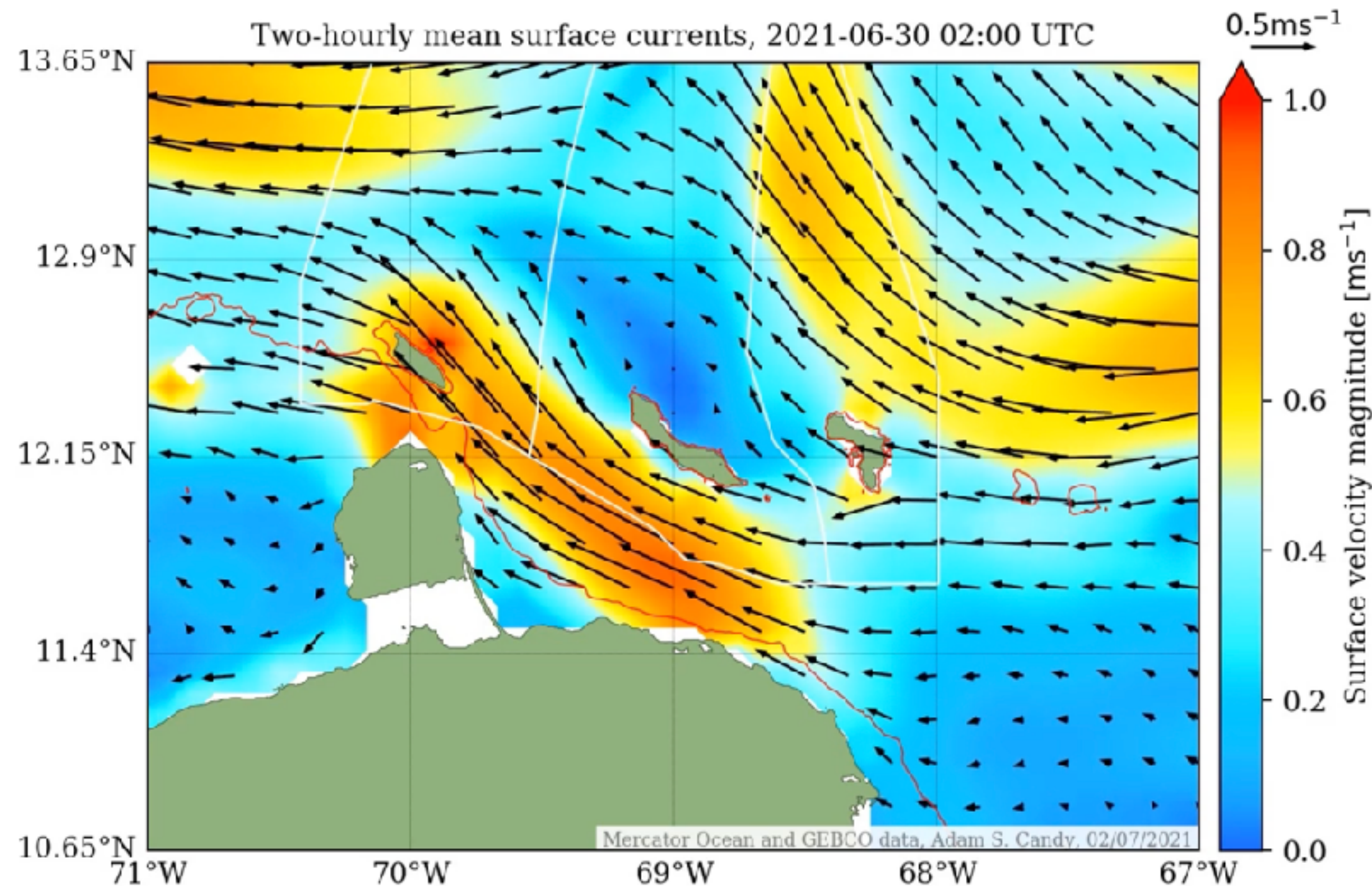


Local-scale hydrodynamics: current velocity time series on the shallow reef



Differences due to bathymetry, roughness, local wind, waves, orientation of the coastline, ...

What comes next?



CaribbeanWatch by <https://candylab.org>

- **Numerical modelling of currents and waves** around Curaçao and verifying predictions with collected in-situ data
- Releasing virtual particles around the island and assessing their trajectories with **Lagrangian Particle tracking** techniques (OceanParcels)
- Estimating **residence times of water** around nearshore coral reefs
- Combining our findings with colleagues' observations: land-derived substances, state of the corals, nutrients in the water column

Danki! Questions?

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References:

1 Waitt institute (2017). Marine Scientific Assessment: The State of Curaçao's Coral Reefs.