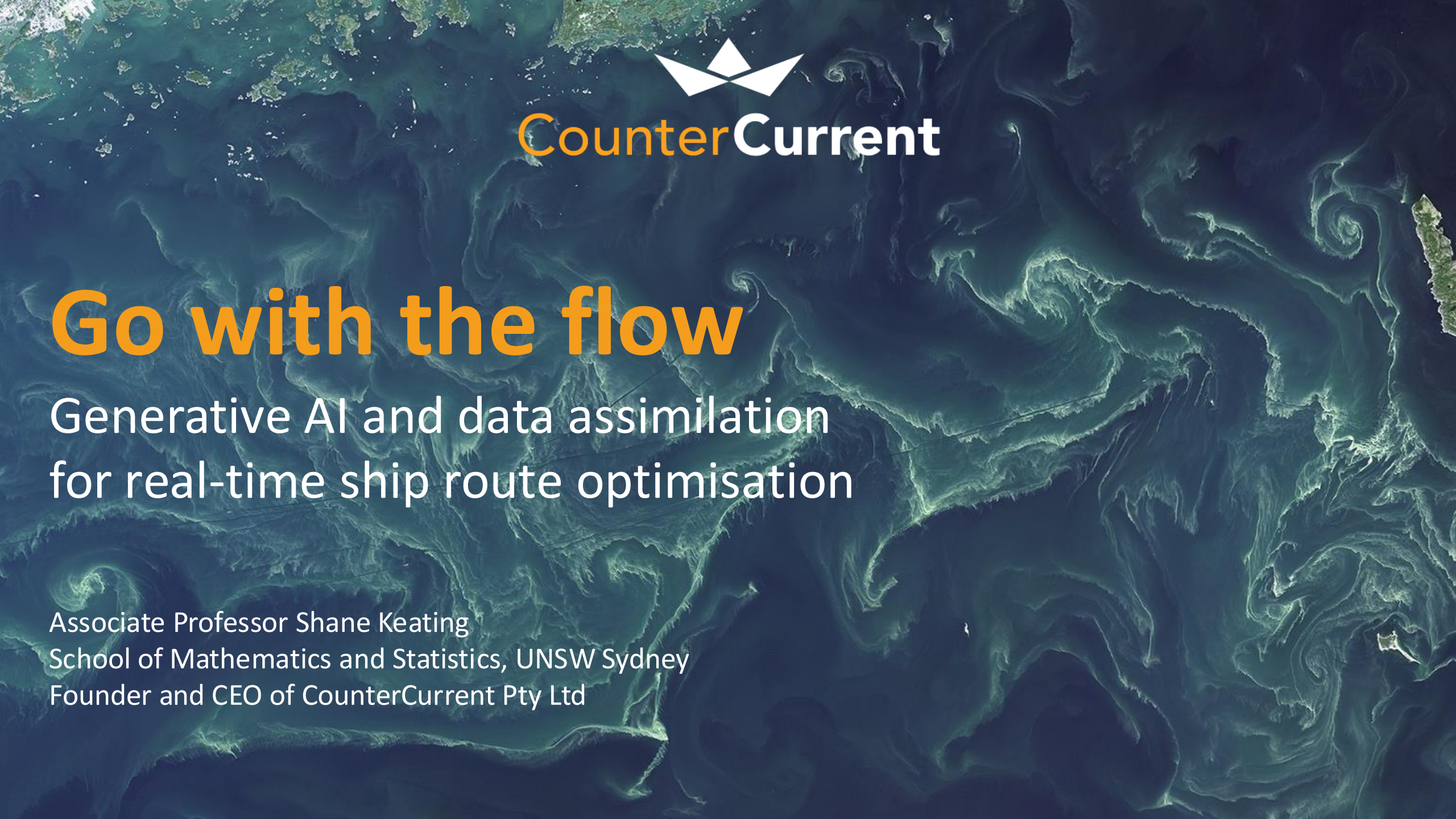
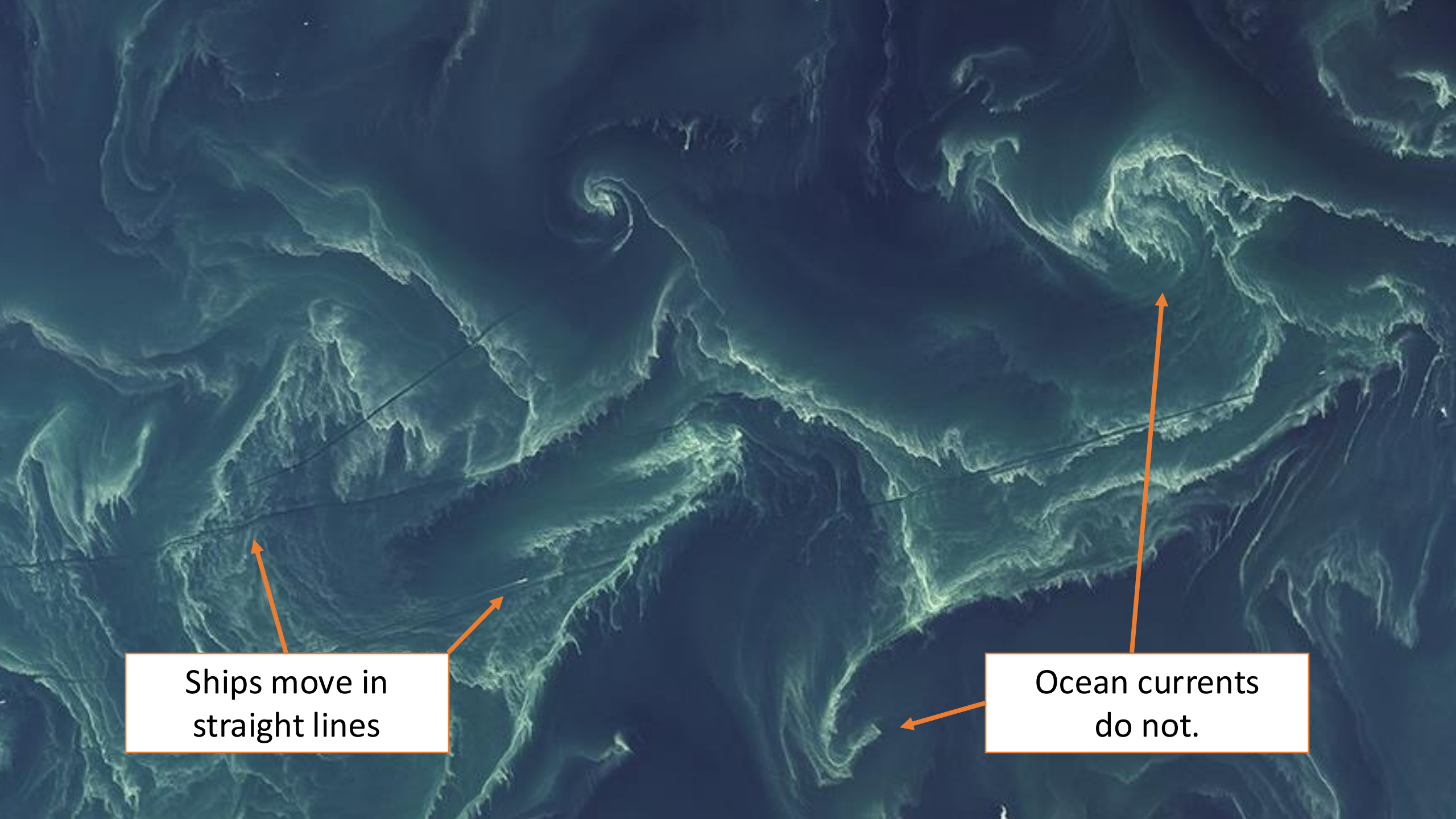


Go with the flow

Generative AI and data assimilation for real-time ship route optimisation

Associate Professor Shane Keating
School of Mathematics and Statistics, UNSW Sydney
Founder and CEO of CounterCurrent Pty Ltd


Ships move in straight lines
Ocean currents do not.

CounterCurrent

Shipping produces **3% of global GHG emissions** – 1.1 GT CO2 equivalent/year

The International Maritime Organization has committed to **cut emissions 20% by 2030**

Net zero fuels are not yet available at scale and **6x more expensive than bunker fuel**.

There is an urgent need for cost-effective shipping decarbonization solutions.

Harness ocean currents for fuel-efficient routes

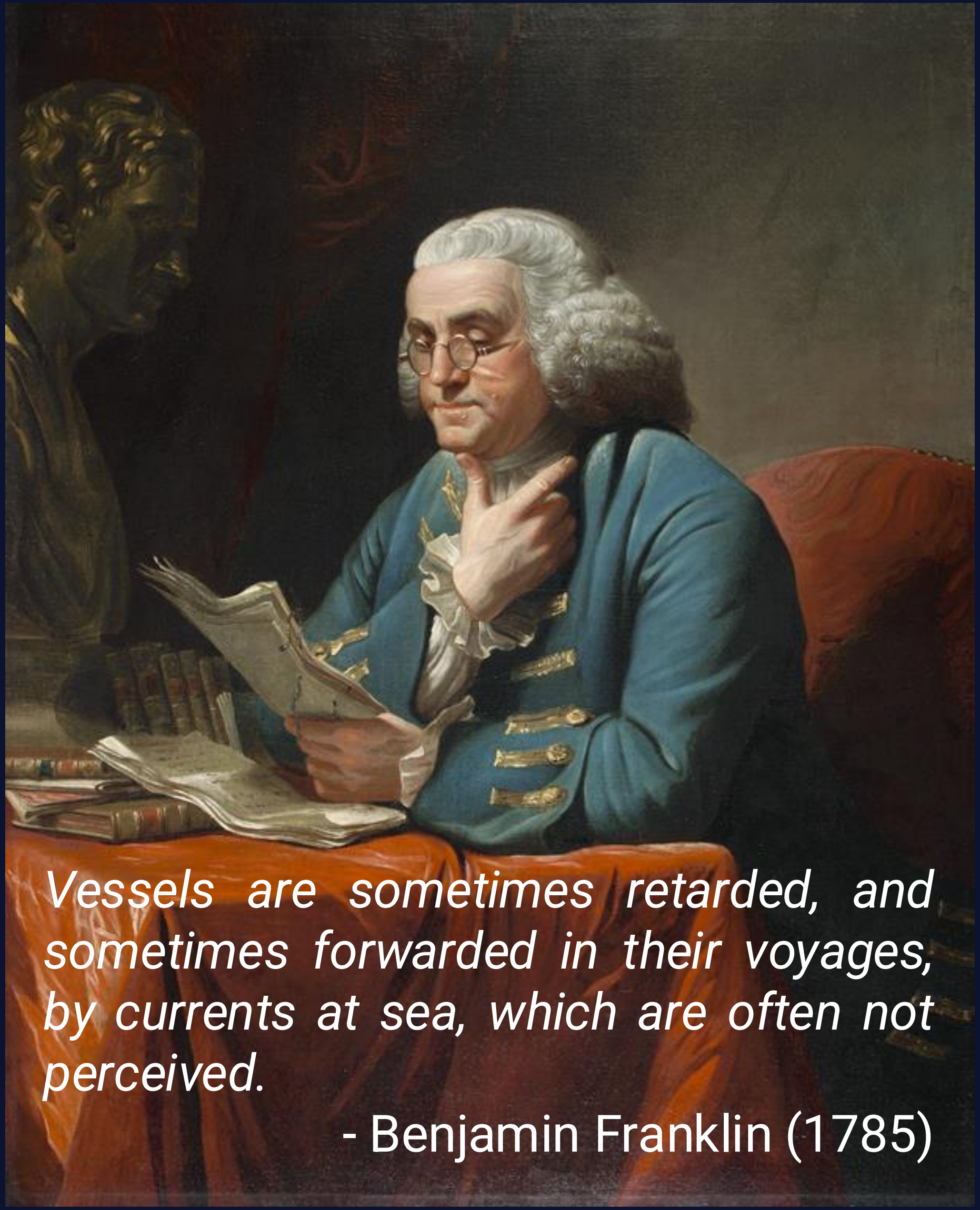
Dynamic navigation for optimized vessel routes: “**Google Maps for the sea**”

Low-cost onboard sensors for real-time ocean forecasting

AI “digital twin” of each ship for accurate emissions monitoring

Smart routing can be implemented at scale across the **existing maritime fleet**

Ship route optimization



Vessels are sometimes retarded, and sometimes forwarded in their voyages, by currents at sea, which are often not perceived.

- Benjamin Franklin (1785)

“Fuel optimization has been done before.”

Ocean Engineering 213 (2020) 107697

Ship weather routing: A taxonomy and survey

Thalis P.V. Zis *, Harilaos N. Psaraftis, Li Ding

“Research has shown that weather routing can lead to significant fuel consumption savings per voyage that will depend on the sector. In the majority of the papers reviewed in this survey, **fuel consumption savings are typically reported to reach values between 3% and 5%**.”

Transportation Research Part D 93 (2021) 102768

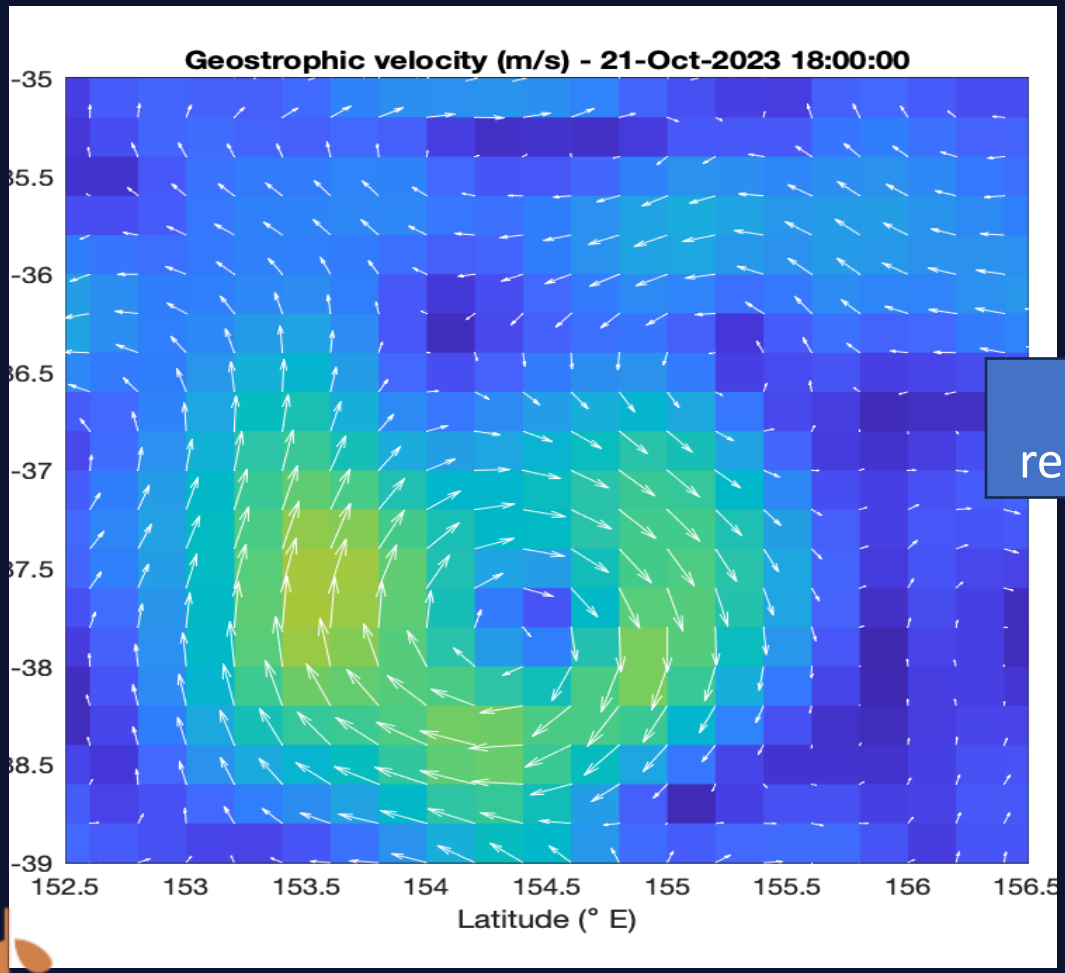
Literature review on emission control-based ship voyage optimization

Hongchu Yu [a,b], Zhixiang Fang [c], Xiuju Fu [d], Jingxian Liu [a,*], Jinhai Chen [b,*]

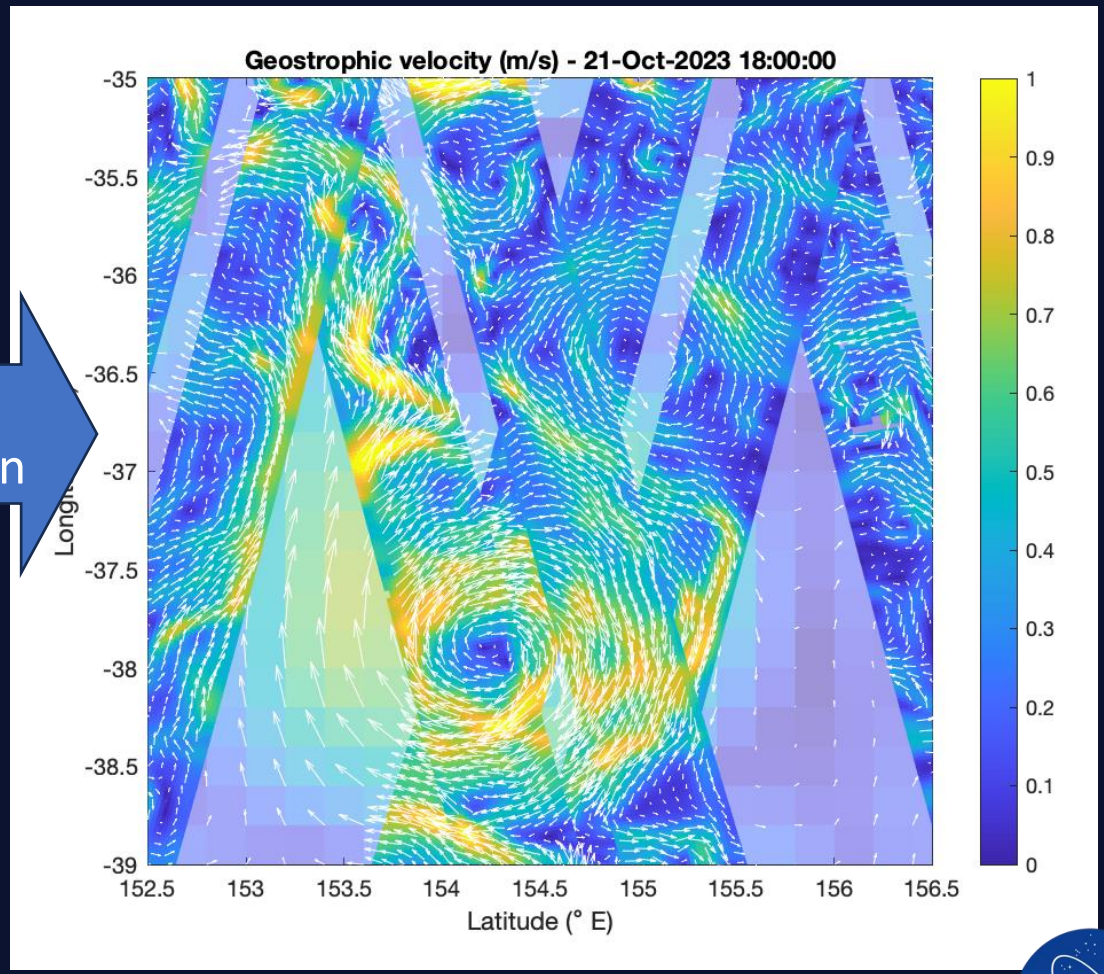
“The result of the evaluation in different studies, obtained by comparison with constant speed, no optimization, shortest path, or big circle movement without course deviation, shows a reduction in tons of fuel consumption and **up to 10% percent of fuel costs may be saved**.”


INDIAN OCEAN
SOUTH ATLANTIC OCEAN
SOUTHERN OCEAN

Missing piece #1: Ocean eddies



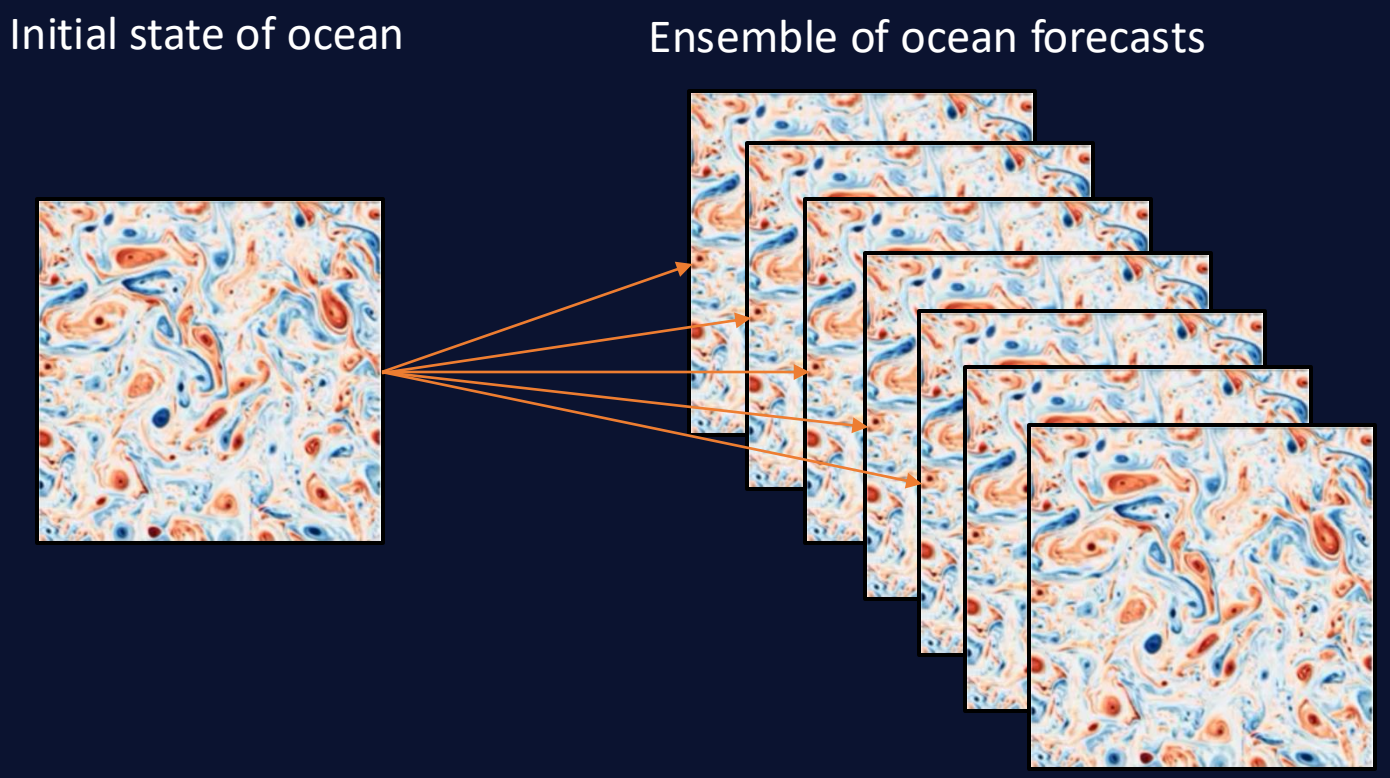
10x resolution



AVISO (CNES)

SWOT (CNES/NASA)

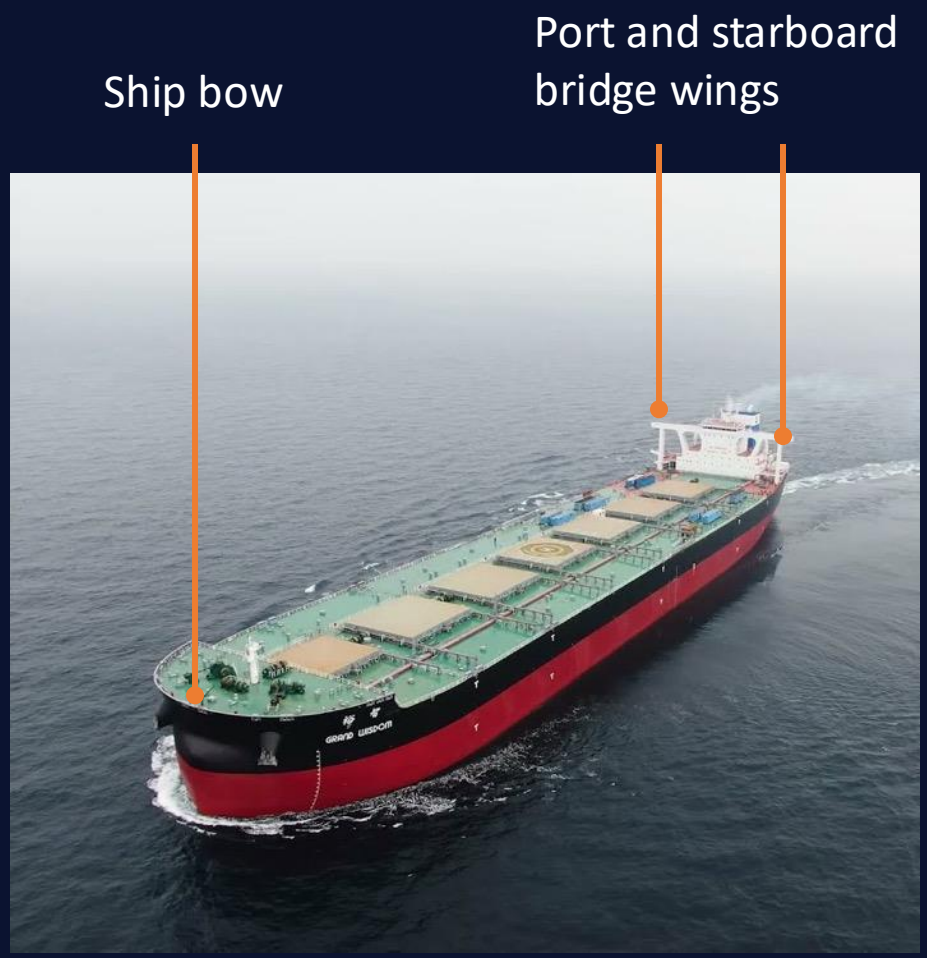
Missing piece #2: Uncertainty/Risk estimation



- **All forecasts are uncertain.** Eddy-resolving forecasts are even more uncertain.
- Represent uncertainty using an **ensemble of forecasts.**
- Efficiently generate ensemble using **generative AI model** trained on archived forecasts, satellite data, and in situ data

Missing piece #3: In situ data from the vessel

Triton Mk2 Metocean sensor



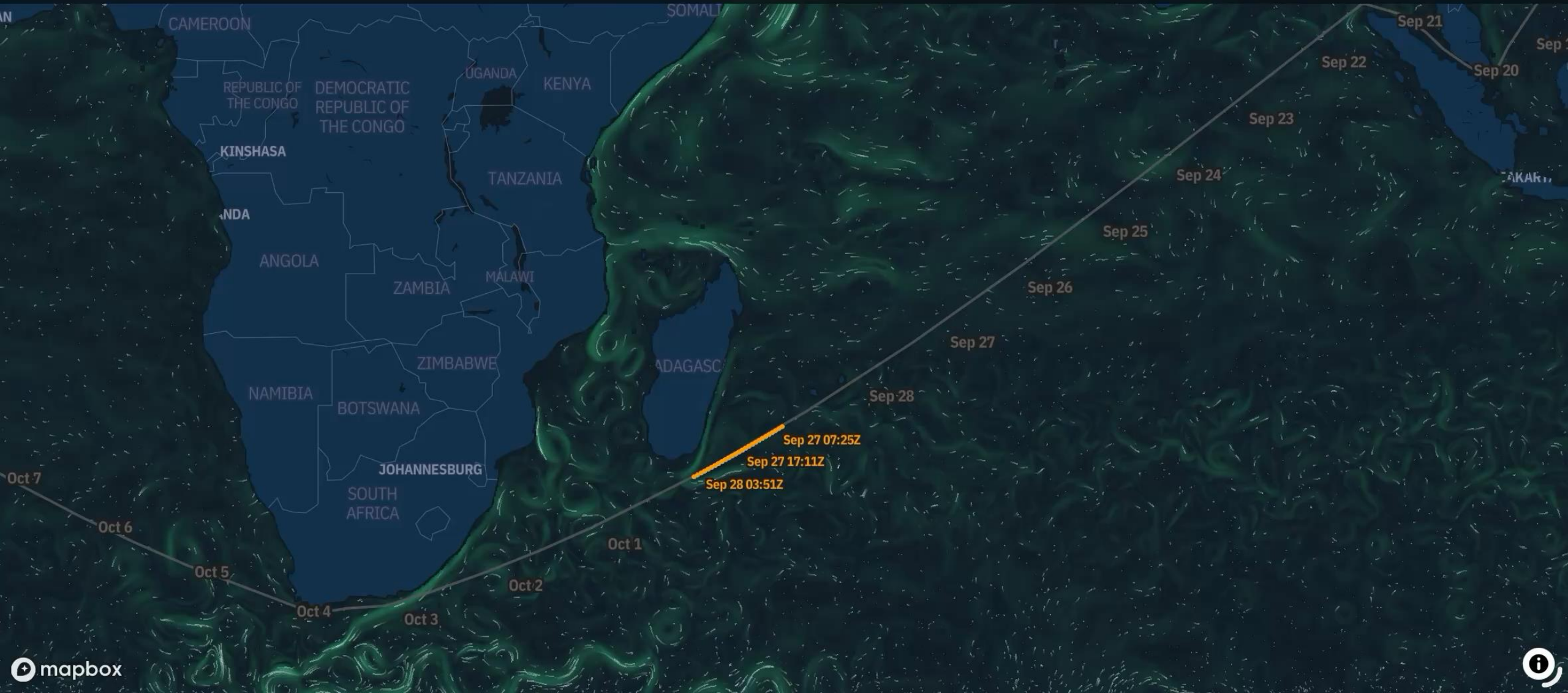
Sea trial on 340-meter VLOC

Example Ship MMSI 000000000

Issued 09/27/2025 UTC

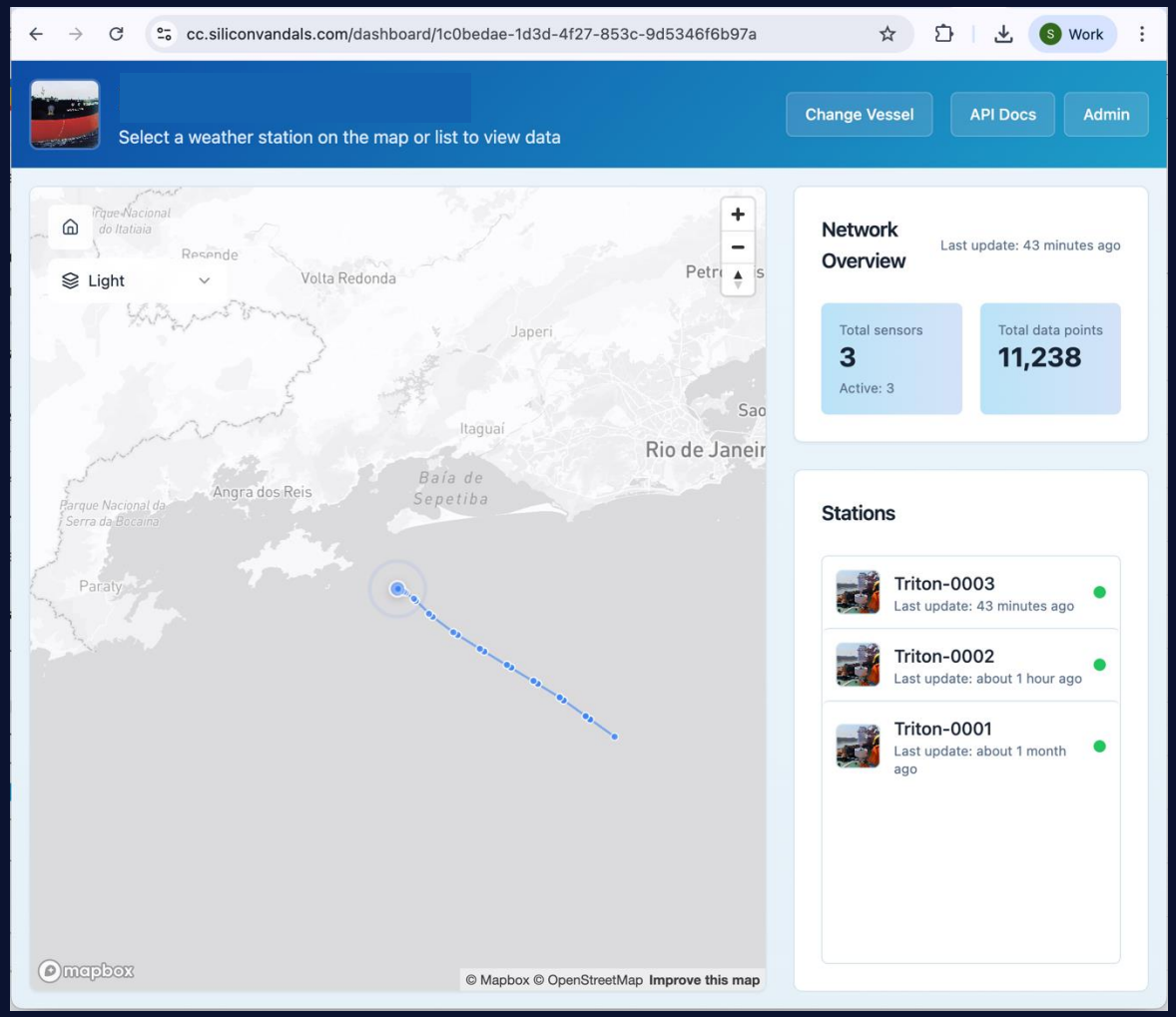
8.6 MT of fuel savings found

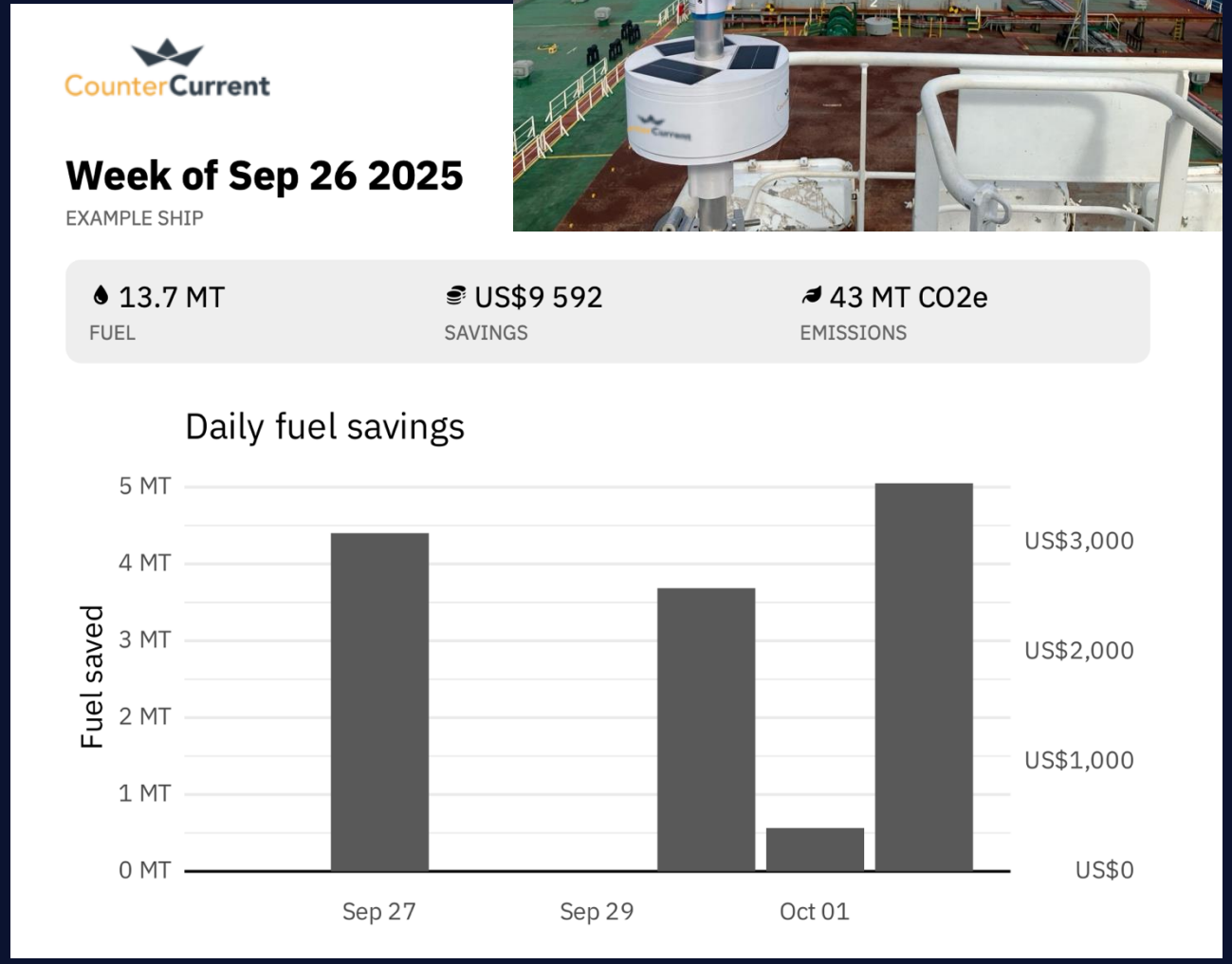
Show controls



Pilot project

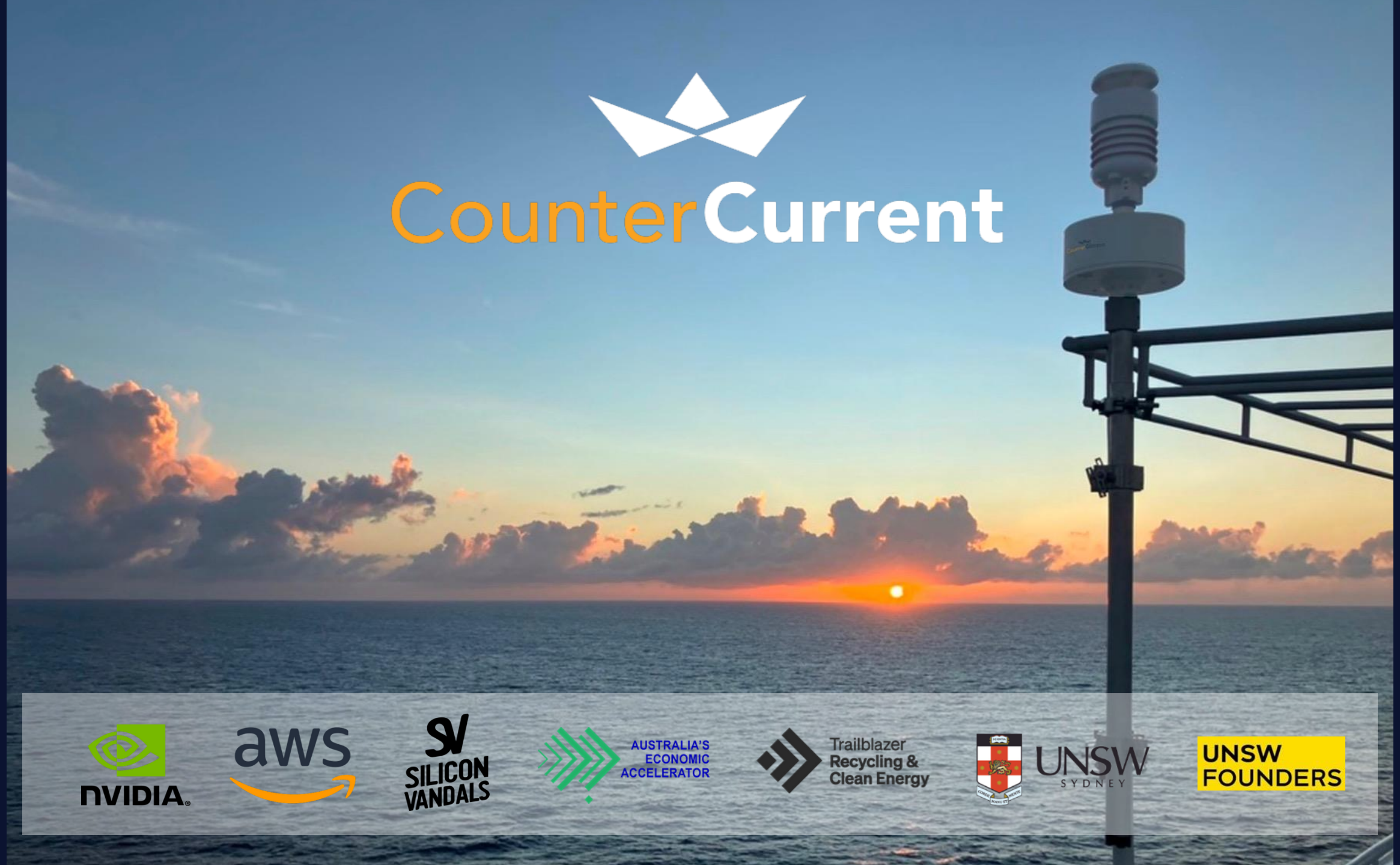
3 month paid trial on 340-m VLOC on China – Brazil route





Pilot project

The *Douglas Mawson*, Aurora Expeditions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