

How ECCO supports winds and currents mission concept

Hector S Torres¹

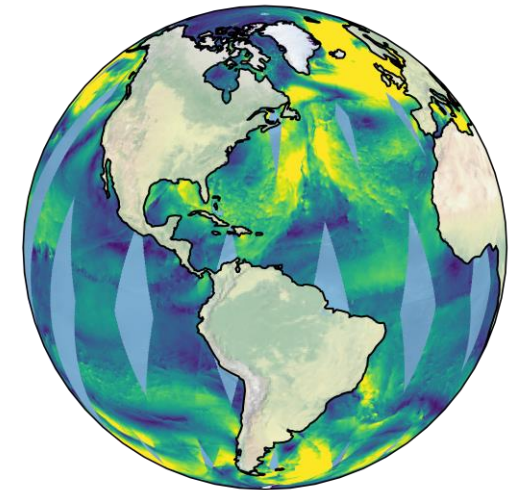
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Andrew F. Thompson², Ernesto Rodriguez¹, Dimitris Menemenlis¹,
Hong Zhang¹

¹ *Jet Propulsion Laboratory, California Institute of Technology*

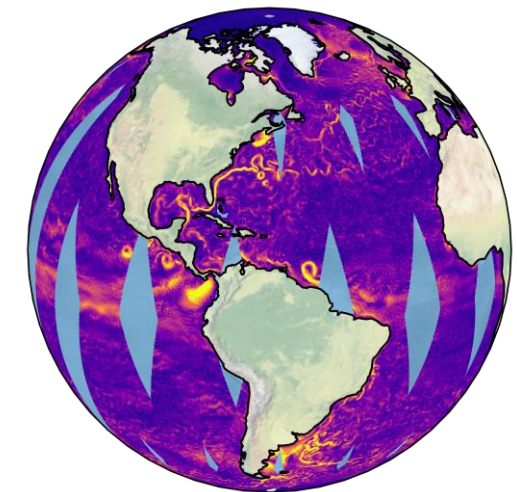
² *California Institute of Technology*

ECCO Annual Meeting, Pasadena, CA

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0 5 10 15
ODYSEA 1-day Wind Speed [m/s]

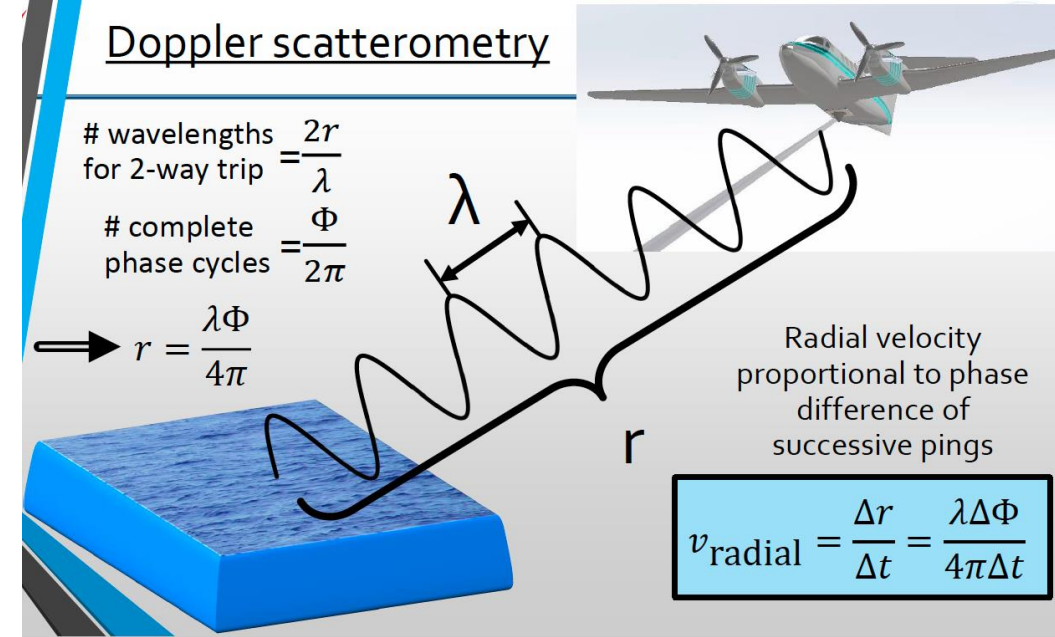


0.0 0.2 0.4 0.6 0.8 1.0
ODYSEA 1-day Surface Current Speed [m/s]

The winds and currents mission is based on the doppler scatterometry concept (Rodriguez , 2018 Remote Sensing)

- **Technology successfully tested last year during the S-MODE campaign. It worked!**

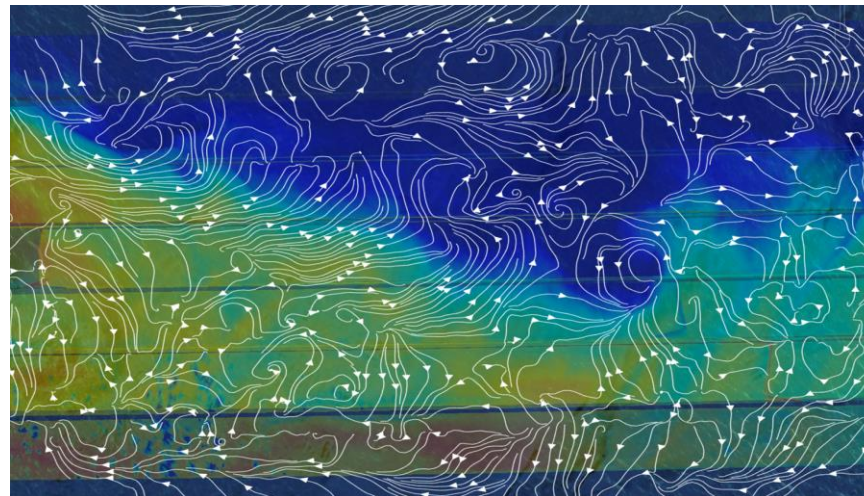
- For the first time, the total surface velocity, at submesoscales, was mapped



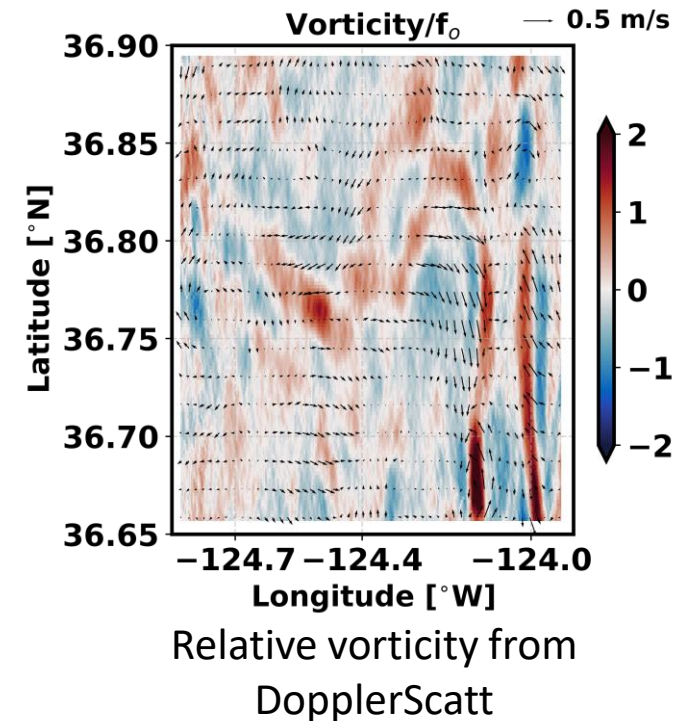
S-MODE campaign



JPL-DopplerScatt Team



Surface currents from JPL-DopplerScatt (streamlines) and sea surface temperature from UCLA MOSES

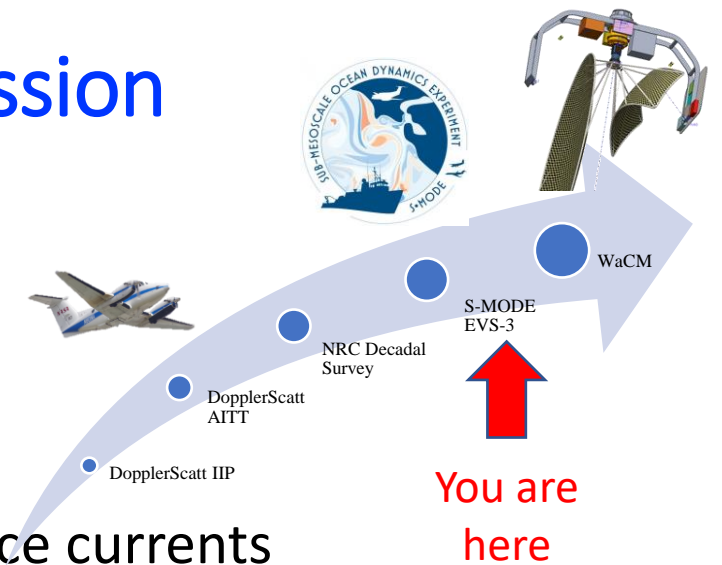


Next step: from airborne mission to satellite mission

- The Ocean Dynamics and Surface Exchanges with the Atmosphere (ODYSEA)

Proposal due by June of this year

- ODYSEA aims to simultaneously measure winds and ocean surface currents
- Spatial resolution of 5 km
- Temporal resolution of twice a day at mid-latitudes
- Wide swath of 1700 km!
- Baseline error of:
 - 0.35 cm/s for surface ocean currents
 - 1 m/s for ocean winds
 - However, the error for surface currents depends on the wind speed



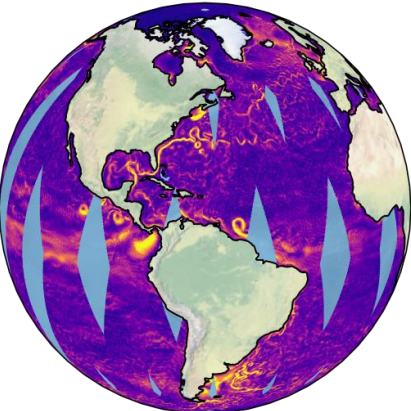
Here is where ECCO plays a critical role

Observing System simulation Experiments

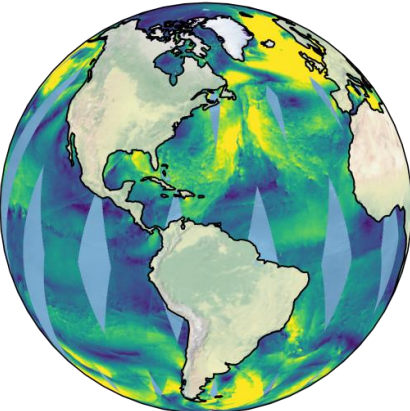
- Our goal is to understand the capabilities of ODYSEA under different scenarios of the error field and sampling strategies

- Topics of interest

- Ocean-atmosphere interactions from large-scale to scales of the size of 30 km
- Kinetic energy fluxes
- Coastal dynamics
- Assimilation of total surface currents
- Equatorial dynamics
- Lagrangian advection

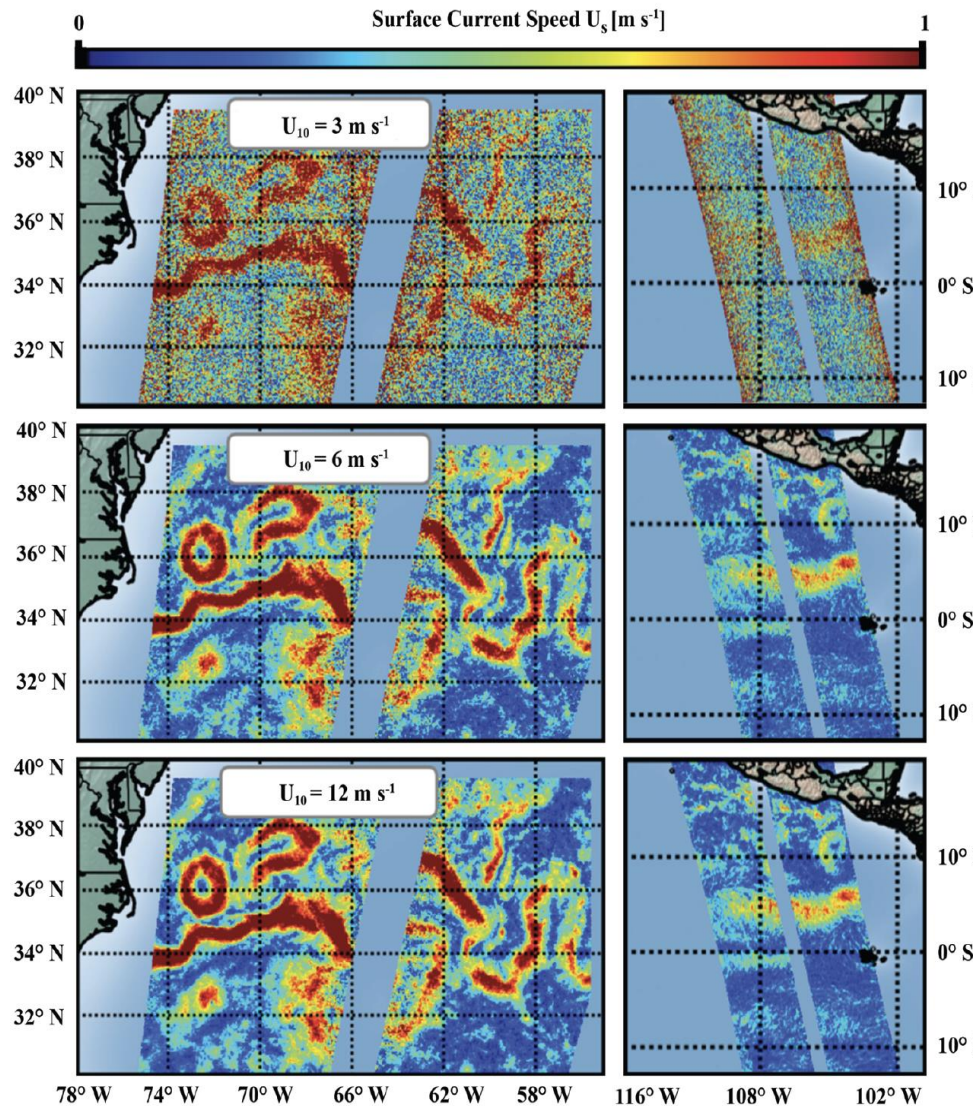


0.0 0.2 0.4 0.6 0.8 1.0
ODYSEA 1-day Surface Current Speed [m/s]



0 5 10 15
ODYSEA 1-day Wind Speed [m/s]

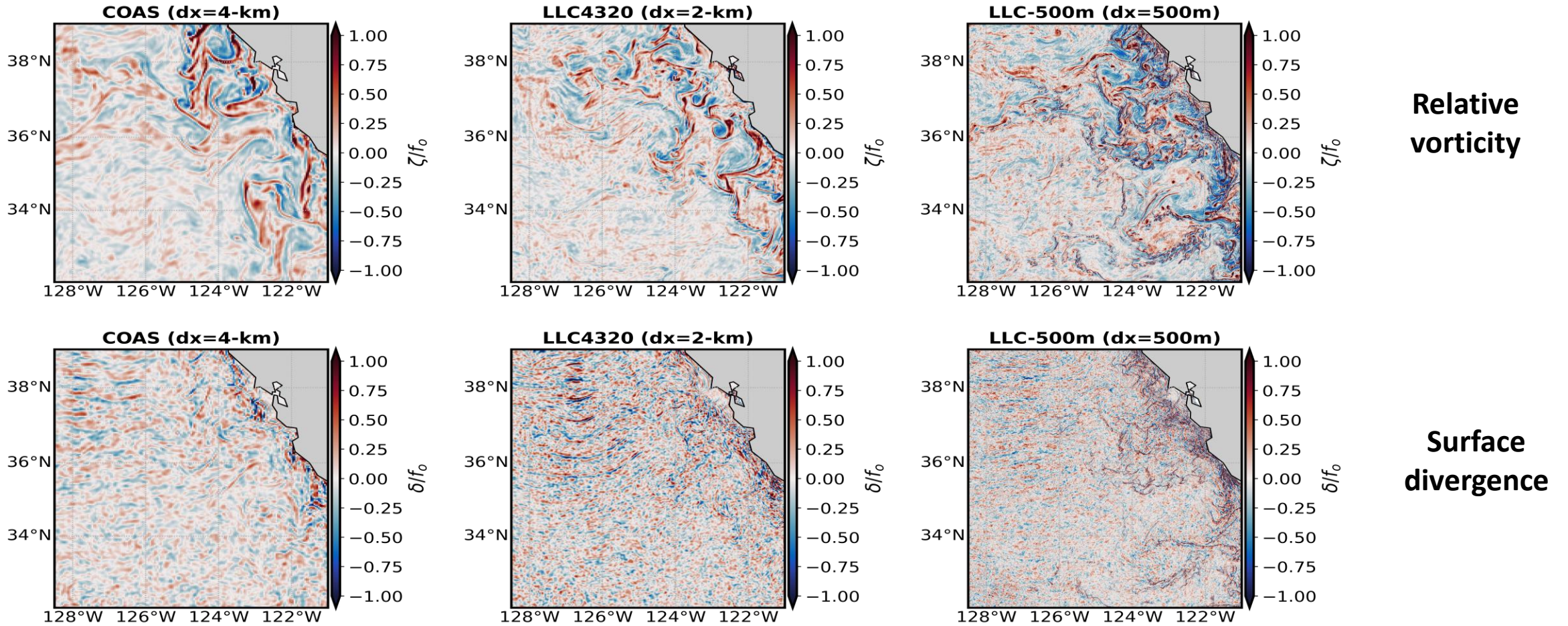
Torres et al. (2022,GMD)



Wineteer et al. (2019,GRL)

ODYSEA Science Team is using different flavors of ECCO

Resolution



Coupled Ocean-Atmosphere

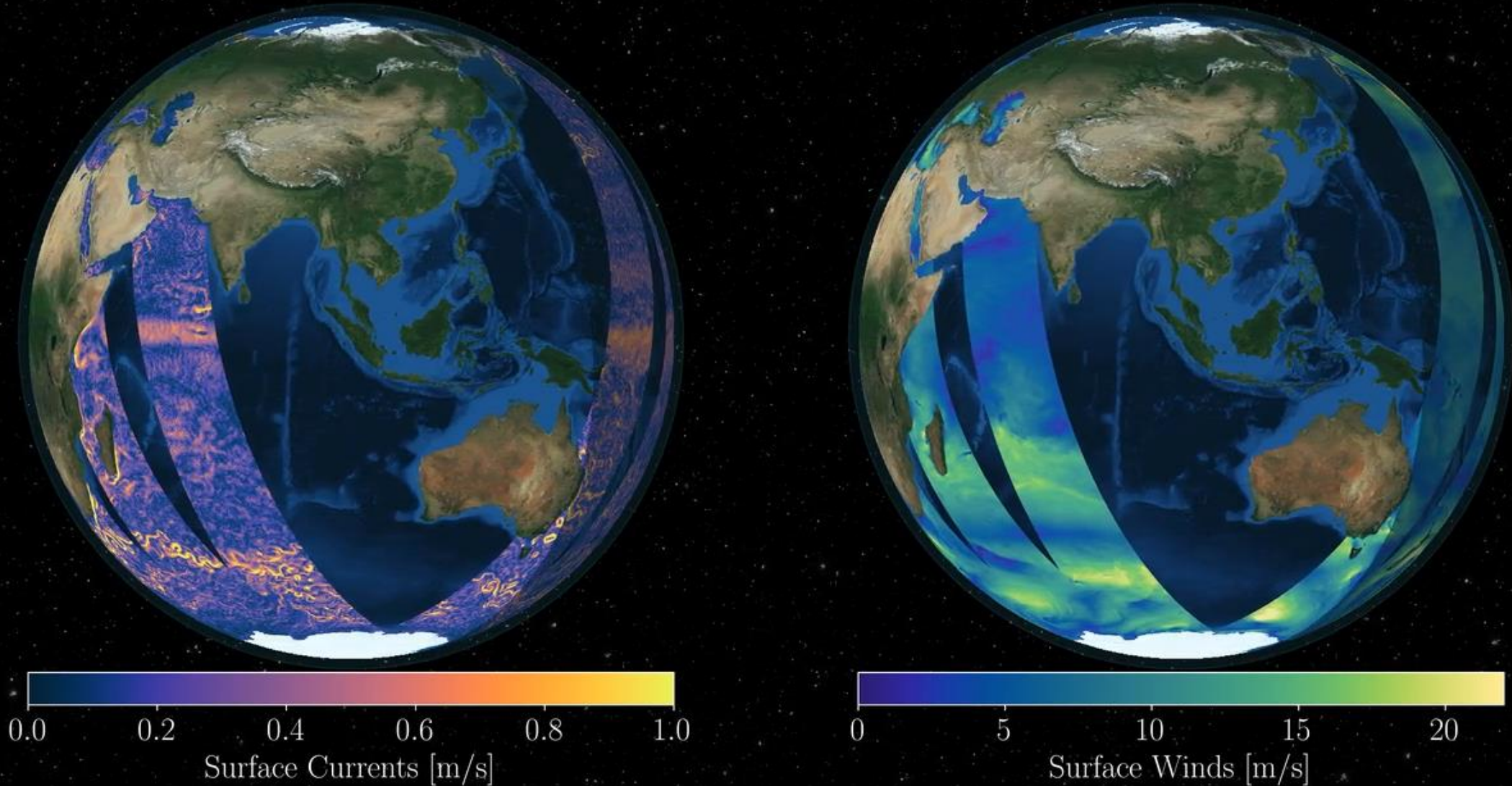
Ocean-only LLC4320

Ocean-only LLC-500m

- Each simulation is being used for different purposes

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Thank you very much ECCO Science Team for all your effort to make ECCO an Easy-To-Use tool!



ODYSEA mission concept