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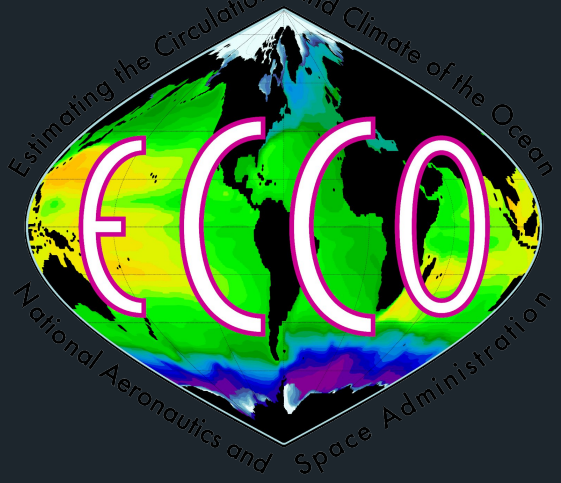



# WELCOME TO THE 2026 ECCO MEETING

https://crios-ut.github.io
https://ecco-group.org

## Housekeeping

- Restrooms
- Breakfast, Breaks & Lunches

- Time for discussion at end of most sessions

- Dinner tonight

# Agenda – broad strokes

**THU**

- Opening: NASA HQ (Nadya Vinogradova-Shiffer & Lesley Ott)
- ECCO Central Production & regional applications
- High-res Applications – a focus on SWOT
- Science applications: ocean dynamics & variability
- Polar & adjoint applications

**FRI**

- Differentiability of GPU-native Oceananigans/ClimaOcean model
- Biogeochemical applications – ECCO-Darwin
- New “Frontiers”?
- Discussion – where next?

Two+ decades of dedicated work, productive collaborations, and guidance from NASA HQ have established ECCO as a NASA core mission and leading global ocean data assimilation effort.

Jet Propulsion Laboratory
California Institute of Technology

TEXAS
The University of Texas at Austin

Massachusetts Institute of Technology

aer | Atmospheric and Environmental Research

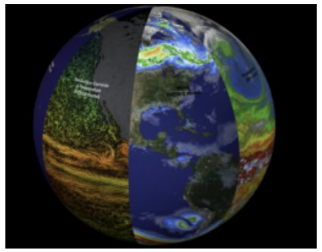
Universität Hamburg
DER FORSCHUNG | DER LEHRE | DER BILDUNG

SCRIPPS INSTITUTION OF OCEANOGRAPHY

science.nasa.gov/earth-science/research/hydrosphere/ocean-physics/

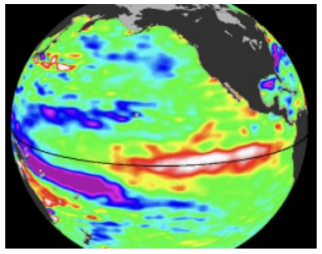
# Science and Research

NASA's Ocean Physics program directs multiple competitively-selected NASA's Science Teams that study the physics of the oceans. Below are details about each science team.

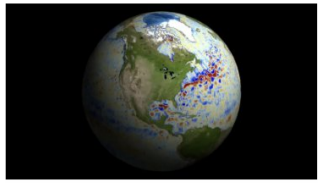


Physical Oceanography (PO)

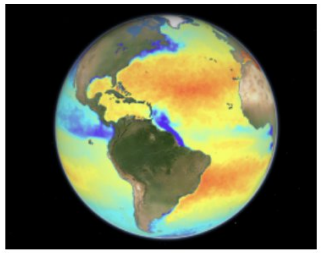
Sea Level Change (N-SLCT)



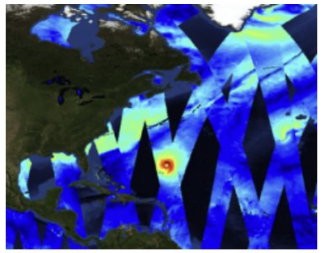
Ocean Surface Topography (OSTST)



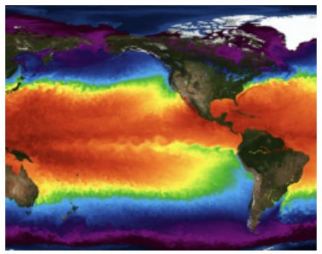
Surface Water and Ocean Topography (SWOT)



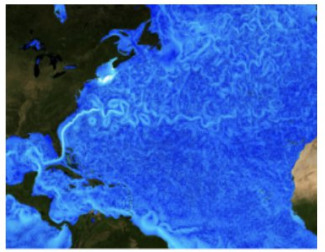
Ocean Surface Salinity (OSST)



Ocean Vector Winds (OVWST)

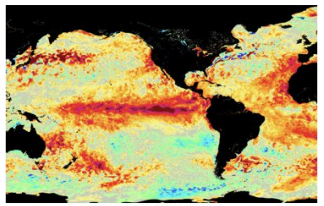


Sea Surface Temperature (SST)



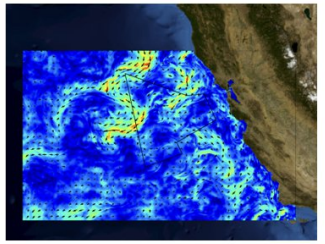
Estimating Circulation and Climate of the Ocean (ECCO)

Coastal Resilience



Ocean Heat and Earth Energy

Salinity and Stratification at the Sea Ice Edge (SASSIE)



Sub-Mesoscale Ocean Dynamics Experiment (S-MODE)

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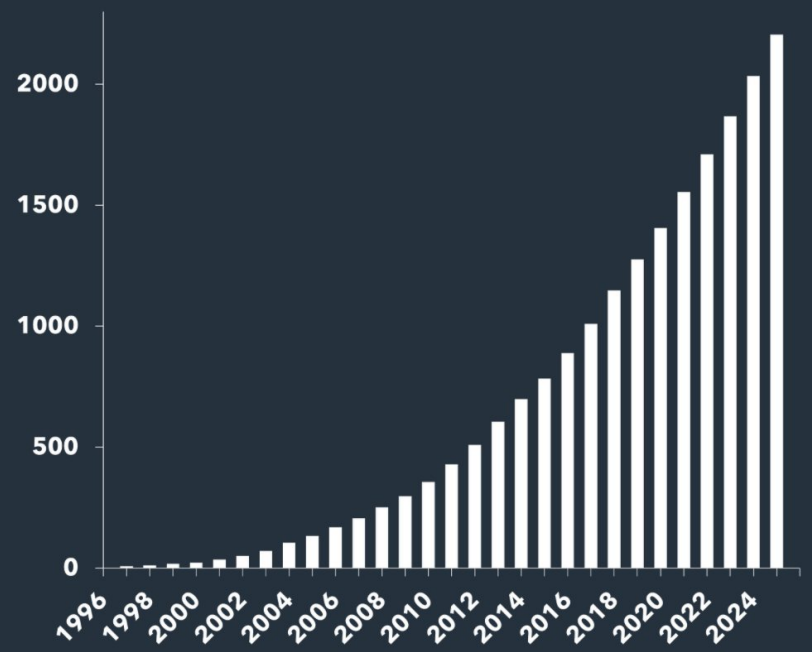
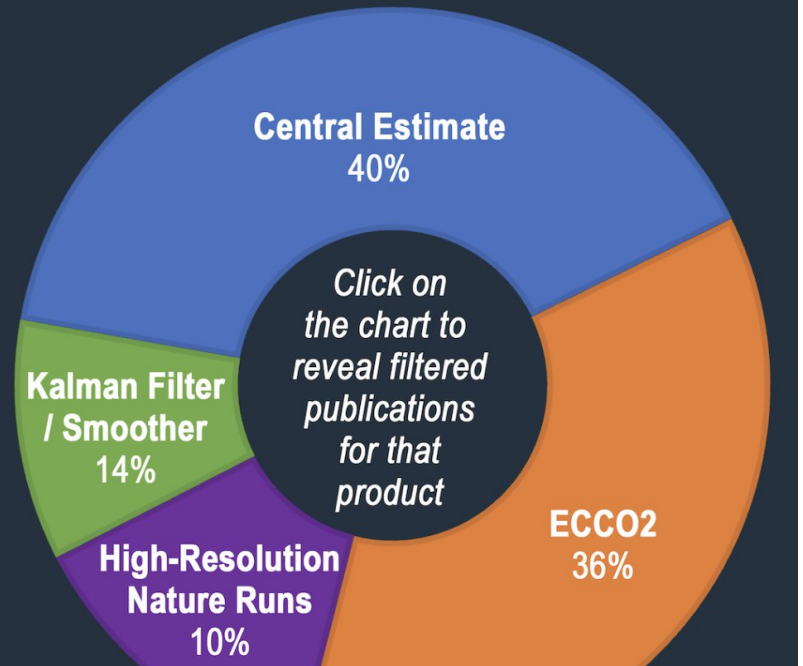



**10**
**PRODUCTS**

*All Products ▶*

*Which Product is Best for You? ▶*



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**182,000+** VIEWS

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### Recent Rapid Rise Along the US Gulf Coast

Influences on this problematic rise come from near and far


### Streaming Climate Signals

"Old" waters may deliver new opportunities to mitigate climate change


### River Discharge & Carbon Flux

Adding river input to ECCO-Darwin shows substantial regional impacts on air-sea carbon exchange


### Layered Stories of Salt & Ice

Two studies help confirm a hypothesis about sea ice formation in the Beaufort Sea


### Tropical Transport Trends

Salinity in the Southeast Indian Ocean is linked to Maritime Continent freshwater


### Taking a Deep – and Wider – Breath

Examining one of our ocean's lungs reveals some surprises

## ECCO Connections: 01/2022 - 12/2026

**(1) Enhance ECCO Central Estimates (ECCO-CE) and the State Estimation System**

- Begin estimation period in 1980
- Increase resolution to eddy-permitting
- Provide uncertainty estimates
- Increase cadence & reduce latency of new solutions
- Include tidal forcings along with SAL corrections
- Time-varying fluxes from GrIS & melt rate parameterizations
- Include Antarctic ice shelf cavities

## ECCO Connections: 01/2022 - 12/2026

**(2) Improve Estimates of Ocean/Ice Sheet Interaction**

- experimental state estimates of the evolution of the Antarctic and Greenland ice sheets for 2003-present (ISSM)

(3) Explore the Impact of ECCO on Climate Projections

- Experimental subseasonal-to-decadal climate predictions with coupled MITgcm/GEOS
- Explore high-resolution MITgcm/GEOS

## ECCO Connections: 01/2022 - 12/2026

**(4) Advance ECCO as a Community Resource**

- Online tutorials & Python tools
- EMU
- Open-source automatic differentiation (Tapenade)
- ECCO Summer School (2025) and Hackathon
- Input for biogeochemical modeling: ECCO-Darwin
- …

## Next-generation ECCO scientists

Two PhD students who made important contributions to ECCO graduated this year:

- Ivana Escobar, PhD
- Shreyas Gaikwad, PhD

# Celebrating the Class of 2026: Oden Institute Honors CSEM Graduates

By Tai Cerulli

Published May 14, 2026

# Outreach


## Discussion topics – keep these in mind throughout the meeting!

# Where from here?

- quality of current ECCO estimates and how to improve future estimates
- regional modeling & increased resolution
- AI & machine learning
- uncertainty quantification
- Move toward coupled estimation
- How ECCO is helping to address societally relevant issues?
- Engaging the broader research community and students

# Planning for the next steps!

## Discussion topics – keep these in mind throughout the meeting!

- Improved ocean physics with ECCO
- new modeling and data assimilation approaches
  - hybrid DA / machine learning approaches
  - harnessing next-generation, AI-purposed HPC infrastructure
- ECCO within global modeling/reanalysis community (WCRP, IPCC)
- Leading science applications:
  - ocean heat uptake, Earth energy imbalance, and sea level

  large-scale transports and air-sea fluxes of carbon

  assimilation of novel satellite observations
- Leveraging ECCO to advance Earth system prediction and projection
  - Initialization vs. calibration problem