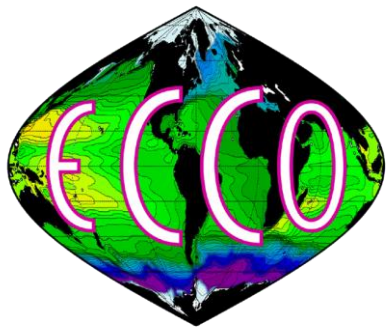


Engaging Scientists with ECCO



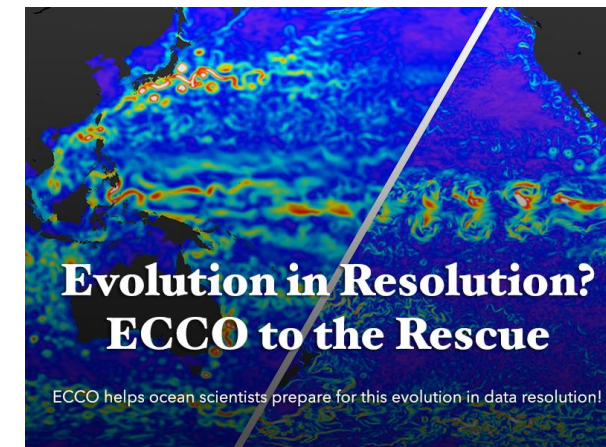
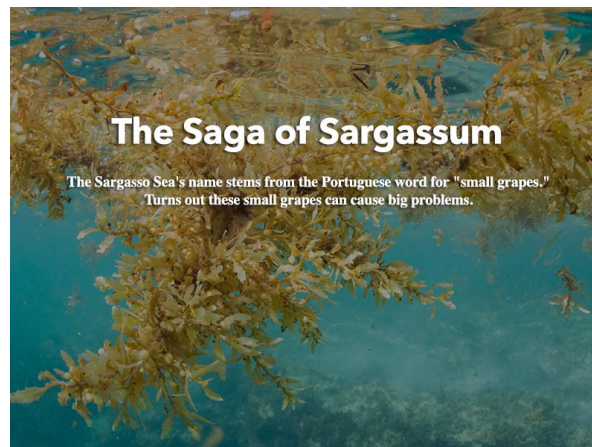
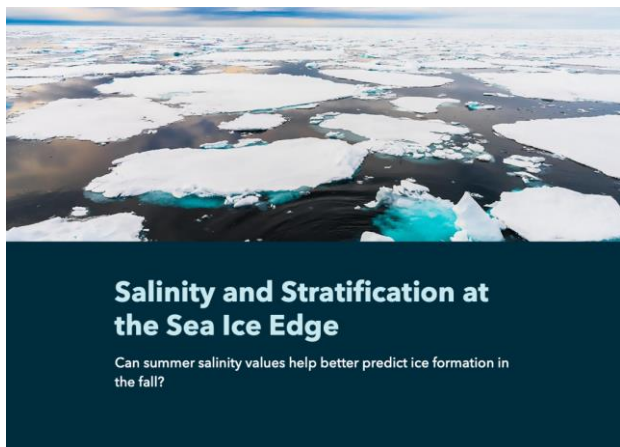
Annette deCharon, ODYSEA LLC

ECCO Annual Meeting, 25-26 January 2023

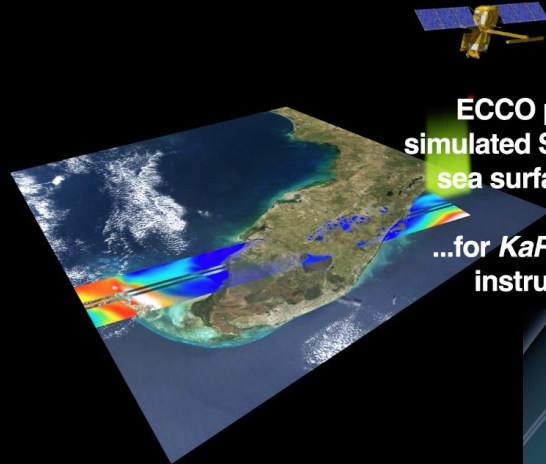


ECCO Supports NASA Science

- Feature added last month and we plan to grow it further
 - **SASSIE**
 - **PACE** (Plankton, Aerosol, Cloud, ocean Ecosystem)
 - Launching 09-Jan-2024
 - **SWOT**
- **We welcome ideas for new StoryMaps** that highlight how ECCO supports NASA science (e.g., Oceans Melting Greenland)

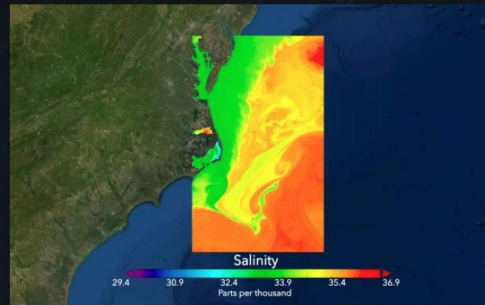


“
To better prepare the science community, ECCO provides simulated SWOT global sea surface height data for both KaRIn and the nadir instruments.



ECCO provides
simulated SWOT global
sea surface height
...for KaRIn & Nadir
instruments

ECCO-SWOT: Global KaRIn Science



What are the two things most people know about the ocean? It's wet and salty! The saltiness of the ocean is measured as "salinity." That's basically the amount of dissolved salt in a volume of seawater.

Together, the temperature and salinity of seawater help determine its *density* (mass per volume). Seawater density helps drive ocean circulation, particularly away from surface and the influence of winds.

NASA Salinity Website

Southern Ocean

There are ECCO-SWOT study sites in the only ocean that circles the entire globe. With howling winds and uninterrupted seawater flow, the upper ocean sees a lot of action!

Three-dimensional temp. evolution based on ECCO 1/48-deg simulation (LLC4320) in the Southern Ocean

ECCO-SWOT: Southern Ocean

In the animation above, blue represents the colder (denser) water mostly found in the deeper and/or higher latitude oceans. Red color

Evolution in Resolution? ECCO to the Rescue

ECCO helps ocean scientists prepare for this evolution in data resolution!

ECCO Annual *Ocean Heat Content* Updates

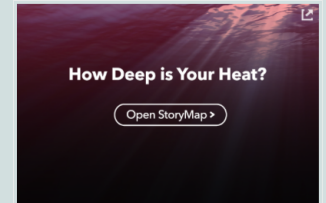
- New page highlights ECCO's ocean heat content (OHC) maps and graphs
 - **Direct download** of ECCO OHC output
 - Links high **upper ocean heat with locations where cyclones** are fueled
 - Provides **time-series trends in the upper 200m and at full depth** (with the caveat that this is an active area of investigation)
- StoryMap – “How Deep is Your Heat?”
 - Explains **ties between OHC & sea level rise**
 - Addresses the **vast ocean volume below 2000m** (e.g., “Draining the Ocean” video)

Ocean Heat Content

Our climate has been warming for decades but where does the excess heat generated by human activity go? The **ocean absorbs more than 90%** of the excess heat from global warming.

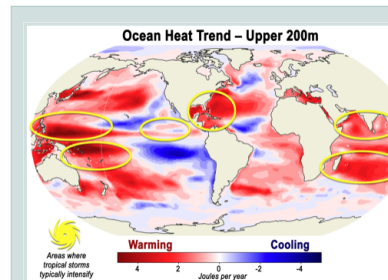
Humans live in the atmosphere, not the ocean. So you can think that the ocean doing us a huge favor... but this “favor” is not only huge, it's deep. And the **depth** that excess heat reaches in our ocean is important to monitor. And ECCO is in the unique position of tracking warming over the **full depth** of the ocean.

[Download ECCO Ocean Heat Content data >>](#)



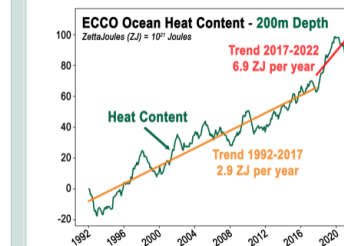
How Deep is Your Heat?

[Open StoryMap >](#)



But let's start at the top, with a map showing **ocean heat trend over the past 30 years** in the upper 200 meters (656 feet) of the ocean. **Red colors** show where warming occurred over these decades. These coincide with areas where destructive hurricanes and cyclones are fueled by warm ocean water.

According to **data from the U.S. Environmental Protection Agency**, North Atlantic hurricane intensity had “risen noticeably” from 2000 to 2020. ECCO reveals that ocean heat content in **upper 200 meters** also rose over that time period (**orange line**). Moreover, the heat content trend accelerated further from 2017 through 2022 (**red line**). This latest increase in the ocean heat content trend is an active area of investigation for ECCO researchers.



How Deep is Your Heat?

[Open StoryMap >](#)

ECCO Annual *Research Roundups*

- ECCO “All Publications” (n=1711)
 - <https://ecco-group.org/publications.htm>
 - **Sort** by Author, Title or Year
 - **Filter** for publications only
- StoryMaps summarize the **scope and range** of ECCO-related research
- Organize each year’s publications by:
 - **Topic**
 - Climate/Air-sea, Biology/Carbon, Circulation, Mesoscale/submesoscale, Polar, Other
 - **Geography**
 - Interactive globes show where studies are conducted



Engaging Scientists with ECCO StoryMaps

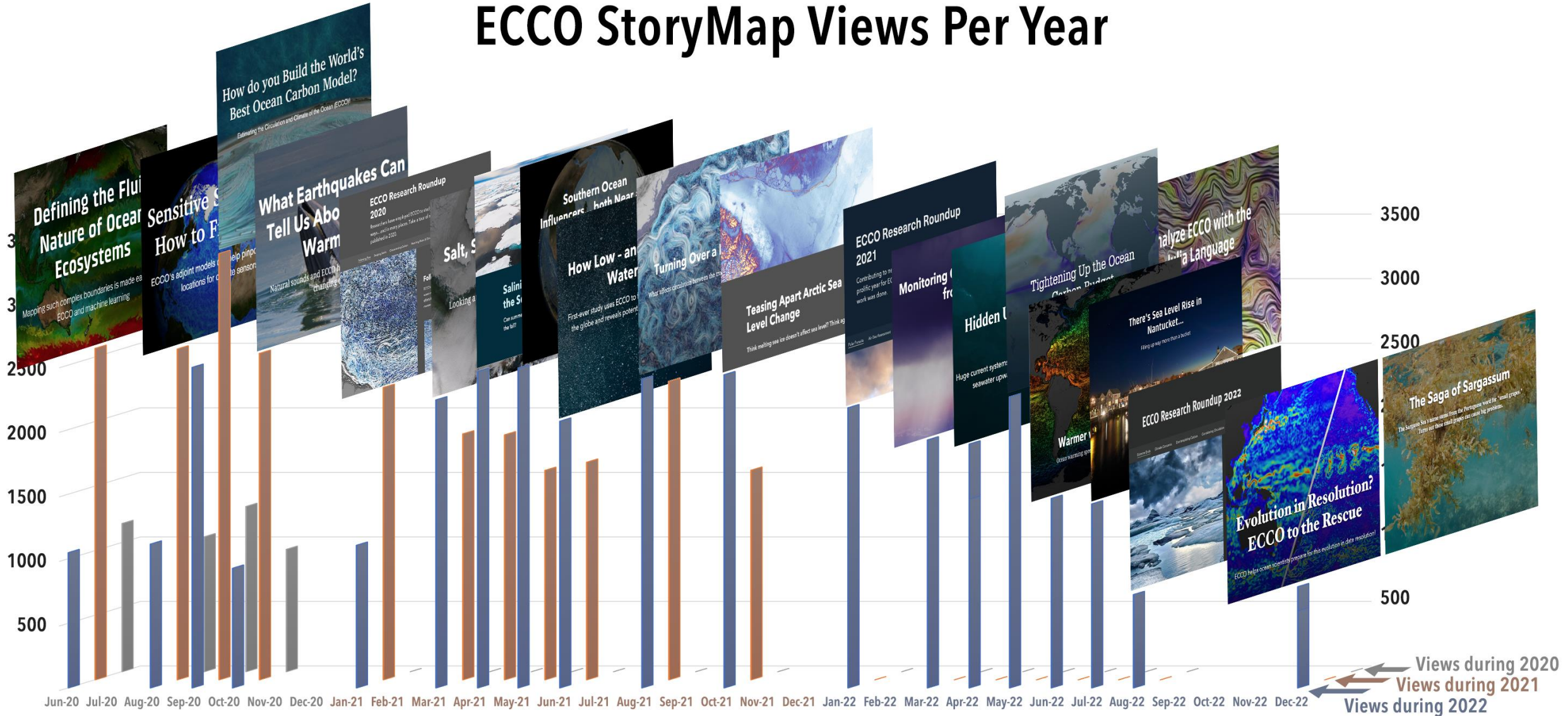
- Target audience is **non-experts who are interested in science**
 - For example, **graduate students** who might consider using ECCO
 - Most are based on “**Featured publications,**” created with one or two authors
- StoryMaps are collectively the **most popular feature** on the website
 - No StoryMap is more popular than the **homepage (4x)** or **latest product page (2x)**



StoryMap Title (Publication author, if applicable)	Release Date	Total Views
Evolution in Resolution?	Dec-22	785
Saga of Sargassum*	Dec-22	598
ECCO Research Roundup 2022	Aug-22	724
There's Sea Level Rise in Nantucket... (Wang)	Jul-22	1426
Warmer waters, Faster flow (Peng)	Jun-22	1469
Tightening Up the Ocean Carbon Budget (Carroll & Menemenlis)	May-22	2256
Hidden Upwelling Systems Revealed (Liang)	Apr-22	1890
Analyze ECCO with the Julia Language (Forget)	Apr-22	1463
Monitoring Ocean Heat Below... from Above (Trossman)	Mar-22	1922
ECCO Research Roundup 2021	Jan-22	2171
Teasing Apart Arctic Sea Level Change (Fukumori)	Oct-21	4051
Turning Over a New Climate (Kostov)	Aug-21	4705
How Low — and Slow — Can Water Go? (Rousselet & Cessi)	Jun-21	3753
Southern Ocean Influencers... both Near and Far (Boland)	May-21	4102
Salinity and Stratification at the Sea Ice Edge*	Apr-21	4351
Salt, Sairdrones, SMAP & ECCO (Vazquez)*	Mar-21	4137
ECCO Research Roundup 2020	Jan-21	3371
What Earthquakes Can Tell Us About Ocean Warming (Callies & Wu)	Oct-20	4405
How do you Build the World's Best Ocean Carbon Model? (Carroll & Menemenlis)	Sep-20	7066
Sensitive Spots...and How to Find Them (Loose)	Aug-20	4723
Defining the Fluid Nature of Ocean Ecosystems (Sonnewald)	Jun-20	4765

**Featured on multiple websites*

ECCO StoryMap Views Per Year



Views during 2020
 Views during 2021
 Views during 2022

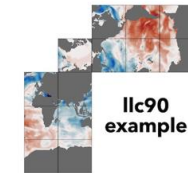
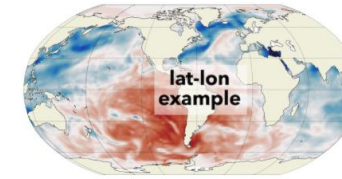
ECCO at PO.DAAC

- New page designed to help users navigate to ECCO products at PO.DAAC
- **Grid type** examples are shown
- Products organized into **19 topics**
 - **Icon buttons** subset products by topic
- Users can also filter by:
 - **Grid**
 - lat-lon, llc90, Time series/Other
 - **Time**
 - Monthly mean, Daily mean, Snapshot, Constant

ECCO at PO.DAAC

The latest ECCO "Central Estimate" product (Version 4, Release 4) is comprised of over 100 ocean, sea-ice, and atmospheric surface parameters spanning from 1992-Jan-01 to 2018-Jan-01. The complete ECCO V4r4 product exceeds 3TB across more than 385,000 granules, available from NASA's Physical Oceanography Distributed Active Archive Center (PO.DAAC). [This page allows you to subset and filter the 90 products now available at PO.DAAC.](#)

Most parameters are available on two spatial grids: $1/2^\circ$ latitude-longitude grid ("lat-lon") and ECCO's native model grid "lat-lon-cap 90" ("llc90"). Below is one product example shown as lat-lon and llc90 grids.



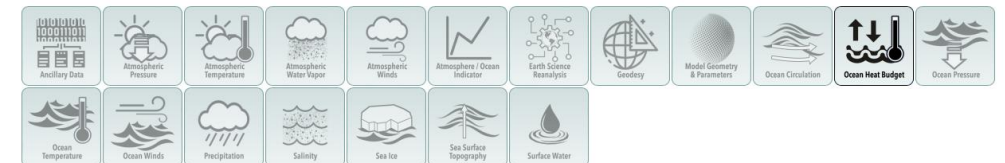
Note, however, that some parameters are provided as global-mean time series or other non-mapped grids.

Most of these parameters are provided as both *daily* and *monthly time* averages. Also, a subset are provided as instantaneous *snapshots* to support closed budget analyses.

Ready to jump ahead? [Visit PO.DAAC's ECCO Dataset List](#) | [Check out the ECCO Analysis Tool](#)

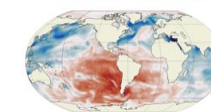
This page is designed to help you navigate among these options, providing direct links to data sets at the PO.DAAC. *Results below link to ECCO Version 4 Release 4 unless otherwise indicated.*

To help you identify the types of data available, we provide icons for the *19 topical areas* addressed by ECCO.

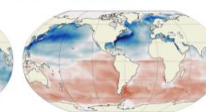


Click any icon above to **SHOW** that topical area in the list below. You can also **filter your results** by *Grid* or *Time* below by clicking the appropriate buttons. Click any tile below to access the ECCO dataset at PO.DAAC.

Filter by Grid Filter by Time



ECCO Ocean and Sea-Ice Surface Heat Fluxes - Daily Mean 0.5 Degree



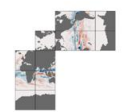
ECCO Ocean and Sea-Ice Surface Heat Fluxes - Monthly Mean 0.5 Degree



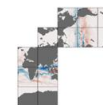
ECCO Ocean and Sea-Ice Surface Heat Fluxes - Daily Mean llc90 Grid



ECCO Ocean and Sea-Ice Surface Heat Fluxes - Monthly Mean llc90 Grid



ECCO Ocean Three-Dimensional Potential Temperature Fluxes - Daily Mean llc90 Grid

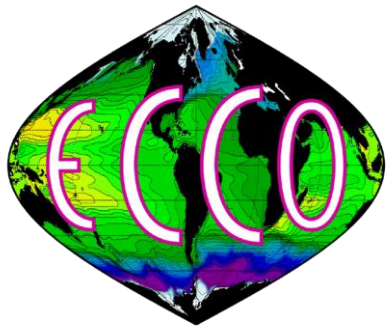


ECCO Ocean Three-Dimensional Potential Temperature Fluxes - Monthly Mean llc90 Grid

Thank you!

Please let me know if you have any questions.

Or feel free to contact me at
<avdecharon@gmail.com>



Annette deCharon, ODYSEA LLC

ECCO Annual Meeting, 25-26 January 2023

