

# ECCO Data Access

## Outline

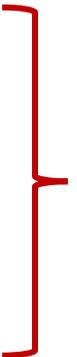
*\*Have your laptops ready with an OSS JupyterHub (<https://sealevel.oss.eis.smce.nasa.gov>) launched so you can follow along!*

- Overview of ways to access ECCO data
- The `ecco_access` Python library
- Get `ecco_access` on your Python path\*
- Tutorial examples to access ECCO data\*
- Try your own example!\*

# How can you access ECCO data/output? Overview

How can you access ECCO output?

- On NASA's Pleiades supercomputer (if you have an account)
- Through the ECCO Data Portal hosted by NASA Advanced Supercomputing (<https://data.nas.nasa.gov/ecco>)
- ECCO Drive (<https://ecco.jpl.nasa.gov/drive>)
- AWS Cloud S3 bucket (ecco\_model\_granules)
- Through PO.DAAC (currently version 4 release 4 only)
  - Includes access in-cloud from S3 bucket



**Ultra high-res  
ECCO simulations  
only available here**

# ECCO Drive (legacy access) vs. PO.DAAC

**ECCO Drive** - <https://ecco.jpl.nasa.gov/drive>

- Many versions of ECCO available
- Not as complete a selection of variables for version 4 release 4 (esp. daily)

**PO.DAAC (NASA Earthdata)** - <https://search.earthdata.nasa.gov>

- Only version 4 release 4/4b available currently
- More fields available with daily resolution, snapshots, etc.
  - Enables 3-D budget closures for volume, heat/temperature, salt/salinity/freshwater at daily as well as monthly time resolution

## ECCO Drive

[Back to WebDAV Credentials](#)

Current Location:

files / Version4 / Release3 / nctiles\_monthly /

| Name             | Last Modified       | Size |
|------------------|---------------------|------|
| Parent Directory | -                   | -    |
| ADVr_SLT         | 2018-04-07 00:21:00 | -    |
| ADVr_TH          | 2017-04-21 23:32:24 | -    |
| ADVx_SLT         | 2017-04-21 23:15:28 | -    |
| ADVx_TH          | 2017-04-21 22:46:23 | -    |
| ADVxHEFF         | 2017-04-20 22:46:55 | -    |
| ADVxSNOW         | 2017-04-20 22:47:31 | -    |
| ADVy_SLT         | 2017-04-21 23:23:07 | -    |
| ADVy_TH          | 2017-04-21 22:54:26 | -    |
| ADVyHEFF         | 2017-04-20 22:47:05 | -    |
| ADVySNOW         | 2017-04-20 22:47:40 | -    |
| DFrE_SLT         | 2017-04-24 16:20:25 | -    |
| DFrE_TH          | 2017-04-21 23:43:24 | -    |
| DFrI_SLT         | 2017-04-24 16:27:51 | -    |
| DFrI_TH          | 2017-04-21 23:50:18 | -    |
| DFxE_SLT         | 2017-04-21 23:01:49 | -    |
| DFxE_TH          | 2017-04-21 22:25:57 | -    |

The screenshot shows the NASA Earthdata Search interface. The search term 'temperature' is entered in the search bar, resulting in 90 matching collections. The interface displays a list of projects on the left, including ABoVE, AQUARIUS SAC-D, ATDD, ATom, BOREAS, CAMEX, CERES, CMS, CWIC, DISCOVER, DISCOVER-AQ, ECCO (selected), ECOSTRESS, EOS, FIFE, FIRE, FIREX-AQ, and GCPEX. The main content area shows three search results for ECCO datasets:

- ECCO Ocean Density, Stratification, and Hydrostatic Pressure - Daily Mean llc90 Grid (Version 4 Release 4)**: 9,497 Granules, 1992-01-01 to 2018-01-01. Description: This dataset provides daily-averaged ocean density, stratification, and hydrostatic pressure on the native Lat-Lon-Cap 90 (LLC90) model grid from th...  
GEOSS • ECCO L4 DENS STRAT PRESS LLC0090GRID DAILY V4R4 V4R4 - NASA/JPL/PODAAC
- ECCO Sea-Ice and Snow Concentration and Thickness - Daily Mean llc90 Grid (Version 4 Release 4)**: 9,497 Granules, 1992-01-01 to 2018-01-01. Description: This dataset provides daily-averaged sea-ice and snow concentration, thickness, and pressure loading on the native Lat-Lon-Cap 90 (LLC90) model grid from th...  
GEOSS • ECCO L4 SEA ICE CONC THICKNESS LLC0090GRID DAILY V4R4 V4R4 - NASA/JPL/PODAAC
- ECCO Ocean Temperature and Salinity - Monthly Mean llc90 Grid (Version 4 Release 4)**: 312 Granules, 1992-01-01 to 2018-01-01. Description: This dataset provides monthly-averaged ocean potential temperature and salinity on the native Lat-Lon-Cap 90 (LLC90) model grid from the ECCO Versio...  
GEOSS • ECCO L4\_TEMP\_SALINITY LLC0090GRID\_MONTHLY V4R4 V4R4 - NASA/JPL/PODAAC

The interface also includes a map of the Indian Ocean region on the right side, showing the search area. The footer contains the text: 'v1.185.1 • Search Time: 1.4s • NASA Official: Stephen Bernick • FOIA • NASA Privacy Policy • USA.gov' and 'Earthdata Access: A Section 508 accessible alternative'.

# ECCO Drive (legacy access) vs. PO.DAAC

## ECCO Drive - <https://ecco.jpl.nasa.gov/drive>

- Files are organized in a hierarchy of directories
  - By temporal resolution, variable, and year (for v4r4)
- Typically use *wget* or similar to download
- No spatial subsetting prior to download

## PO.DAAC (NASA Earthdata) - <https://search.earthdata.nasa.gov>

- Files are organized by datasets
  - Composed of granules for individual times
- Can select granules via web interface or use Earthdata API
- Opendap enables spatial & variable subsetting prior to download
- **Python-based access library (*ecco\_access*)**

The screenshot shows the ECCO Drive web interface. The current location is 'files / Version4 / Release3 / nctiles\_monthly /'. A table lists files with columns for Name, Last Modified, and Size. Annotations include:

- A folder icon labeled 'Temporal resolution' pointing to the 'Name' column.
- A folder icon labeled 'Variable' pointing to the 'Name' column.
- A grid icon labeled 'Ilc Tile or Year' pointing to the 'Name' column.
- A large downward arrow at the bottom center.

| Name | Last Modified       | Size |
|------|---------------------|------|
|      | -                   | -    |
|      | 2018-04-07 00:21:00 | -    |
|      | 2017-04-21 23:32:24 | -    |
|      | 2017-04-21 23:15:28 | -    |
|      | 2017-04-21 22:46:23 | -    |
|      | 2017-04-21 22:46:55 | -    |
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|      | 2017-04-21 23:23:07 | -    |
|      | 2017-04-21 22:54:26 | -    |
|      | 2017-04-20 22:47:05 | -    |
|      | 2017-04-21 23:50:18 | -    |
|      | 2017-04-21 23:01:49 | -    |
|      | 2017-04-21 22:25:57 | -    |

The screenshot shows the NASA Earthdata Search interface. The search term is 'temperature', resulting in 90 Matching Collections. Annotations include:

- A folder icon labeled 'Dataset (group of related variables)' pointing to a collection entry.
- A grid icon labeled 'Granule (single time entry)' pointing to a granule entry.
- A large downward arrow at the bottom center.

Search results include:

- ECCO Ocean Density, Stratification, and Hydrostatic Pressure - Daily Mean Ilc90 Grid (Version 4 Release 4)
- ECCO Sea-Ice and Snow Concentration and Thickness - Daily Mean Ilc90 Grid (Version 4 Release 4)
- ECCO Ocean Temperature and Salinity - Monthly Mean Ilc90 Grid (Version 4 Release 4)

# The *ecco\_access* Python library

\*From your OSS home directory, use the left panel to navigate to the following tutorial:

`ecco-2024/book/tutorials/ECCO_data_access/ECCO_access_intro.ipynb`. Double-click to open it.

- In the past two years we have developed Python modules for accessing ECCO output hosted on PO.DAAC – either by direct download (*ecco\_download.py*) or in-cloud access (*ecco\_s3\_retrieve.py*)
- These modules have been combined under the new *ecco\_access* Python library, which will (hopefully) soon become a Python package
  - It can be imported into your Python code like a package: `import ecco_access as ea`
- *ecco\_access* includes:
  - Support for a variety of Internet-based and AWS Cloud-based access methods (modes)
  - Query ECCO variable names and descriptions to find the dataset(s) you need
  - A Python interface to download subsets of ECCO granules (powered by Opendap)

# Exercises

Use `ecco_access` to open in your Python workspace (as `xarray` Datasets), without downloading:

- Monthly salinity fields during the time period of the SPURS-1 campaign (2012-2013) near the subtropical Atlantic salinity maximum (25 N 38 W)
- Daily surface wind stress during the life span of Hurricane Katrina (August 23-31, 2005)

*Hints: You can use `grid = 'latlon'`, `mode = 's3_open_fsspec'`, and `jsons_root_dir=join('efs_ecco','mzz-jsons')`*