ECCO: Understanding Sea Level, Ice, and Earth's Climate

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The effort aims to establish ECCO as a “community facility” for studying the ocean & climate

1. Sustained production of the ECCO Central State Estimate,
2. Advance fidelity & capability of the ECCO analysis with a focus on improving understanding of sea level change,
   - include ocean-ice interaction (sea-ice, ice sheet/ice shelf)
   - eddy-permitting resolution
   - tides, SAL, surface pressure
3. Support and foster community utilization of ECCO products.

1. Sustained Production

- Version 4 Release 3 (V4r3; 1992-2015) was released in July 2017,

- V4r3 is being extended to end of 2017 and will be released by EOY,
  - Updated data (altimetry, GRACE, TS profiles),
  - Updated model (e.g., sea-ice time-stepping scheme),
  - Optimization strategy: optimize 2014-2017 separately before optimizing the entire 26-year 1992-2017 estimate so as to minimize computational requirements,

- V4r3, along with other legacy products, are being served via a revamped ECCO website (ecco.jpl.nasa.gov or ecco-group.org). V4r3 is also mirrored at UT Austin (http://web.corral.tacc.utexas.edu/OceanProjects/ECCO/ECCOv4/Release3/)

2a. Including Ice Shelf/Ice Sheet

- Physics:

  Merged MITgcm's shelf-ice and ice-front packages into a single "land ice" package, allowing ocean's interaction with ice shelf/ice sheet both vertically and horizontally,

- Model Configuration:

  Revised V4's geometry (bathymetry) to include interfaces between ocean and ice shelf/ice sheet around Antarctica,

- Control:

  Activated a bulk parameter in the ocean-land ice exchange so as to control the melt,

- Experiment:

  Optimization over a 1-year period, constrained by ice shelf melt data.

2b. Eddy-Permitting Central Estimate

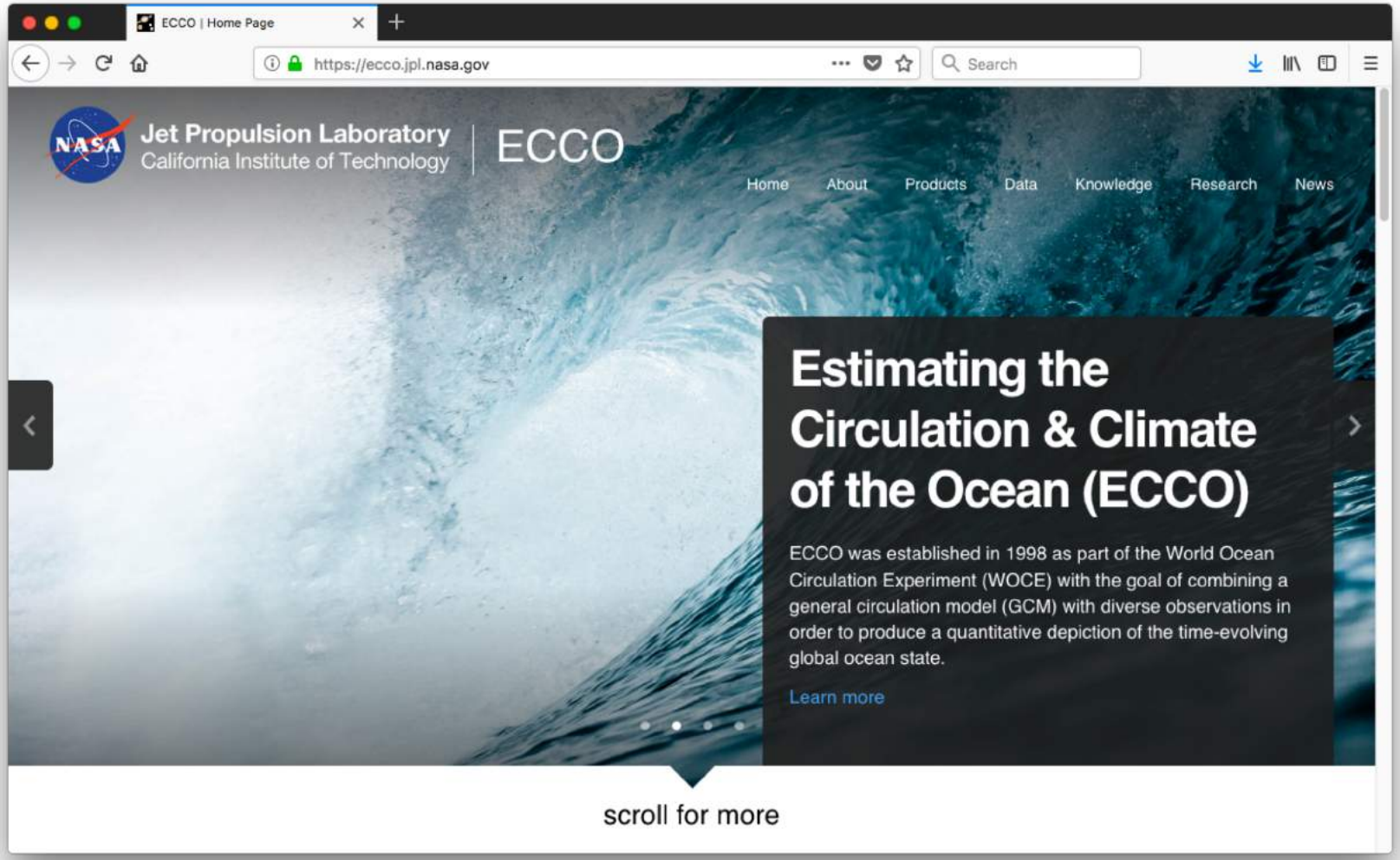
- Version 5 pre-release (alpha) global llc270 solution (2001-2015) downloadable on ECCO ftp site
  - Based on the ECCO v4 R1 cost function formulation
  - 60S~60N: ~28km; high-latitude: ~12km
- Extension of time period to 1992-2017
  - The solution was extended to 2017 and then back from 1992 using updated data constraints (sea-ice, altimetry, GRACE, TS profiles).
- Optimization strategy:
  - First optimize 2001-2015.
  - Assume time-invariant mixing coefficients and ERA interim atmospheric reanalysis bias corrections
  - Use these optimized mixing coefficients and mean reanalysis bias corrections to extend solution over 1992-2017 window
  - Continue iterations

2b. Eddy-Permitting Central Estimate (cont.)

- Transition to llc270 setup as Central Production in 2019
- Benefits:
  - Better representation of ice shelf cavities (marginally)
  - Solution is already well optimized and compares favorably to V4 R3 in terms of misfit
  - Can directly incorporate knowledge gained during ASTE optimization (both setups on same resolution) to improve representation of the Arctic Ocean circulation
- Challenges:
  - Far more computationally expensive, one complete iteration takes 5-8 days depending on queue.
  - 9X greater storage requirements
  - Next experimental resolution: llc540 [1/6°] or llc1080 [1/12°]?

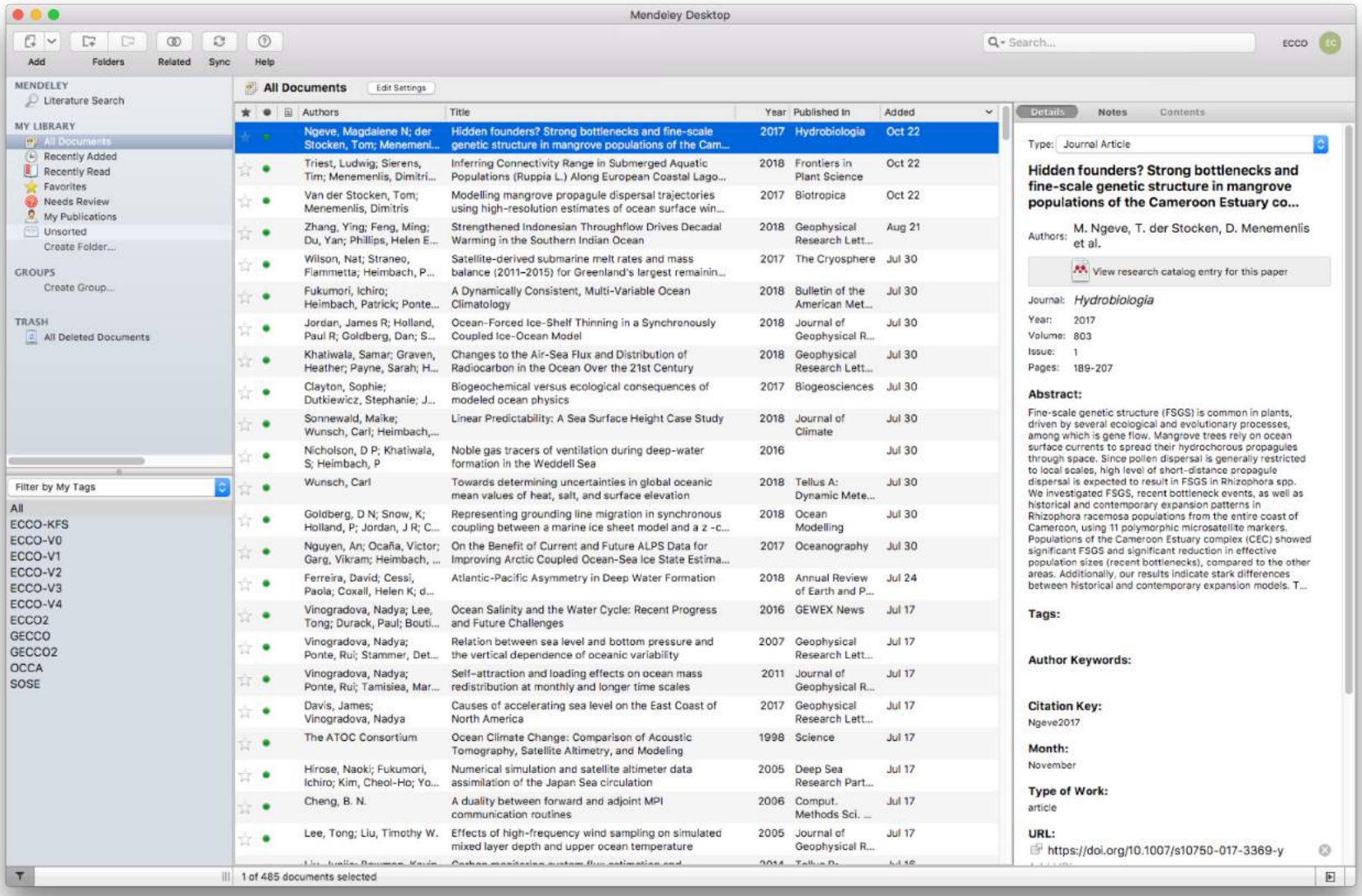
3a. Revamped ECCO Website

https://ecco.jpl.nasa.gov (redirected from ecco-group.org)



3b. ECCO Publication List (Mendeley)

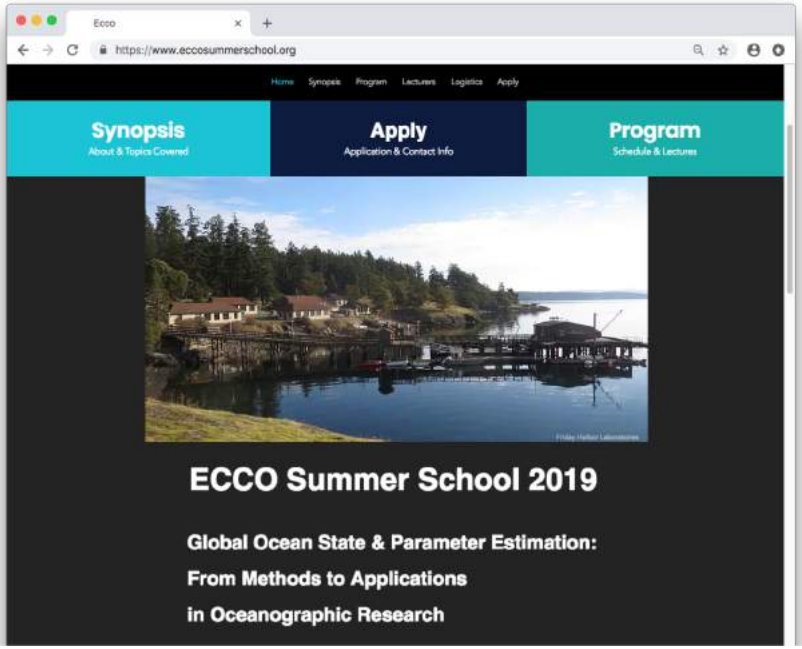
Mendeley Desktop (User ID ecco.consortium@gmail.com)



3c. Workshops and Summer School

Informing the community of what ECCO offers and how to use them.

- ECCO Workshop at 2018 Ocean Sciences Meeting (Portland, OR),
- ECCO Townhall Meeting at 2018 AGU (Washington, DC),
- ECCO Summer School, 19-31 May 2019, Friday Harbor Labs,



https://www.eccosummerschool.org/

- ~30 students
- ~20 lecturers, half from outside ECCO
- Introduce state estimation and its application through lectures, tutorials, and hands-on projects.

3d. ECCO Symposium

Symposium to mark the 20th anniversary of ECCO

- 11-12 September 2019,
- Seaside Forum, Scripps Institution of Oceanography,
- Looking back on progress and looking ahead into the future.