
earth information system
NASA
EXPLORE EARTH
YOUR HOME, OUR MISSION
Earth Information System (EIS)
Monthly Highlights
July 2023
https://www.earthdata.nasa.gov/eis

Sea-Level Change and Coastal Risk

Cloud computing paves the way for reducing sea-level change uncertainty

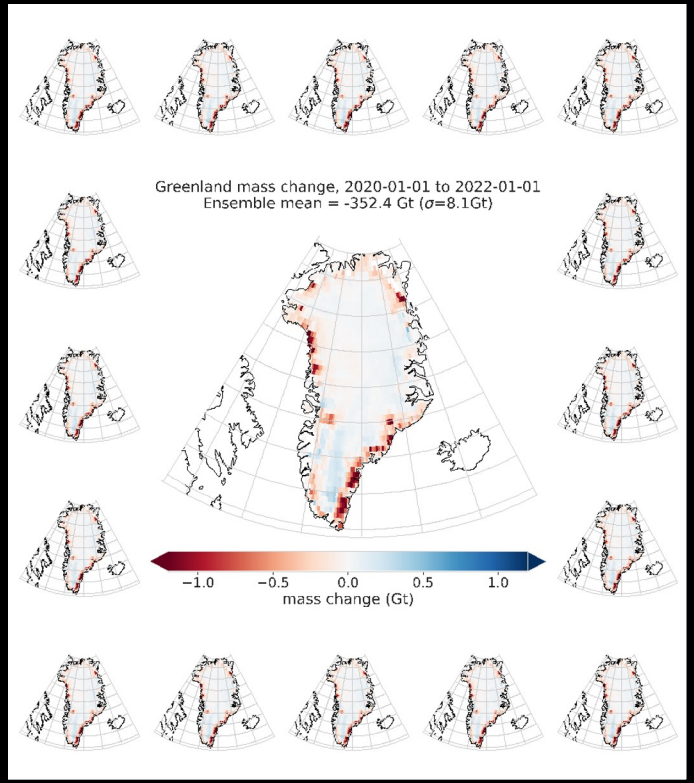
Background: The layer of compacting snow on top of the Greenland and Antarctic ice sheets (this is called the “firn”) is a significant source of uncertainty in ice sheet mass loss estimates from satellite altimetry.

Novel science: We executed a first-of-its-kind ensemble of firn model runs to better constrain uncertainty in Greenland mass loss estimates from ICESat-2, allowing us to identify the main sources of uncertainty in the model.

How EIS enabled this work: EIS researchers collaborated with cloud engineers to build a modeling and analysis pipeline in a single, scalable computing environment. The model ensemble can be configured, run, and analyzed in a few hours on AWS cloud resources. In contrast to on-premises HPC, we were able to optimize the compute cluster for this particular problem and were not limited by queue times.

Open-source science: Building this pipeline in the cloud with Jupyter notebook front ends means it is flexible and portable. Others can easily reproduce and build on what we’ve done.

Access our open-source Jupyter notebooks here.

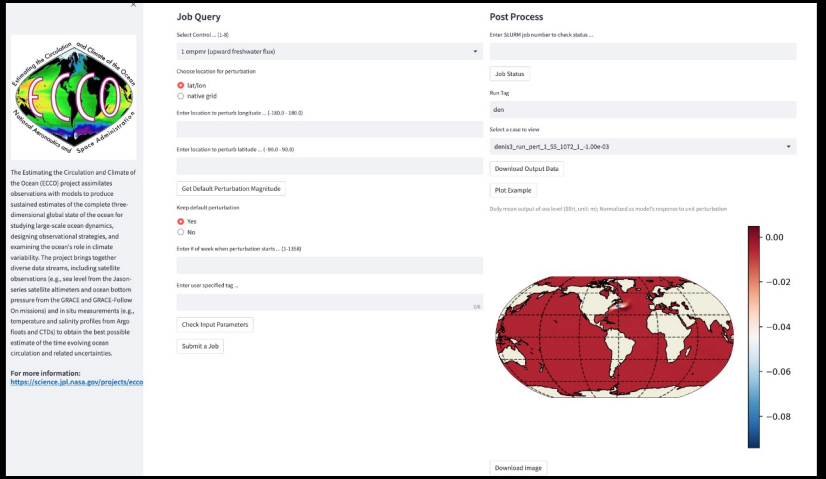


Greenland mass change derived from ICESat-2 ATL15 data and corrected for firn air content change, estimated from the firn model ensemble. Center panel is the ensemble mean, and surrounding panels are ensemble members (16 members).

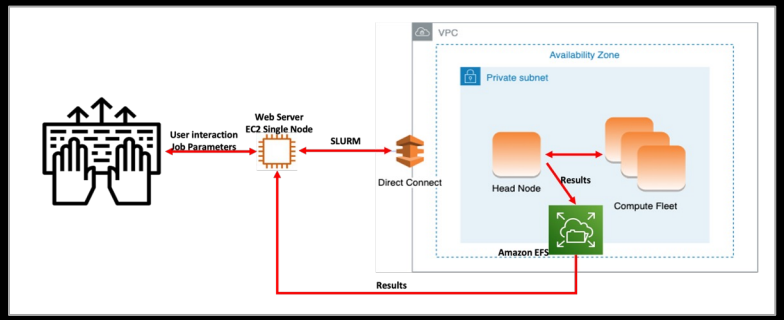
Pinpointing drivers of sea-level change with a click of a button

Estimating the Circulation and Climate of the Ocean (ECCO) modeling utilities deployed on the cloud in Amazon Web Services ParallelCluster.

- The tools permit users to identify and quantify the processes controlling the circulation and state of the global ocean.
- Computations are carried out behind the scenes, allowing users to run the ECCO model **without having to configure** the state-of-the-art model themselves.
- Implementation of these tools on the cloud with Jupyter notebook front-ends will **enhance uptake of NASA's ECCO model output** by lowering accessibility barriers for researchers who are not already familiar with the model.
- Perturbation Tool has been deployed as a benchmark, with public web interface (link). The tool is useful for studying **what-if scenarios** by computing the ocean's response to changes in boundary forcings.
- Guide to ECCO Modeling Utilities can be found here.



Top: Web interface for ECCO perturbation tool. User can configure a perturbation run by selecting forcing, geolocation, perturbation magnitude, etc. The job submit to a 96-core AWS instance (AWS Hpc6a.48xlarge). User can monitor the progress by SLURM job id or user specified tag. Once simulation completed, results can be downloaded to local machine and/or shown through web interface.



Left: Configuration of AWS platform. User interface is hosted on the single node instance and communicates with computing instance through SLURM scheduler. Computing instance is in isolated virtual private cloud (VPC) for higher security. Model results are stored in AWS elastic file system (EFS).

EIS Supports ESD's Ag Community Engagement in Iowa to Discuss Data Needs

Met with: Iowa Corn Growers Association technology and sustainability leads on Corn Board Chair's farm; Farmers (corn, soy, cattle); John Deere Product, Data, and Renewable Fuels Managers; ADM Cargill Starch and Ethanol Plant Managers; ADM Grain Processing Facility and Supply Chain Team; Iowa congressional delegation staff; Continuum Ag precision ag, carbon and soil health business team; Iowa Climate Smart Ag Work Group; Solutions from the Land; and University of Iowa Atmospheric Science and Engineering Researchers.

Discussed: What kind of data and products do farmers and industry partners need to enhance their decision making when it comes to planting timing, reducing nutrients and other inputs, measuring benefits of different crop management practices (cover crops, no till, intercropping, etc.), climate resilience, and sustainability.

Needs: Improve predictability of weather/extreme events affecting agriculture; Better assessments of crop yield forecasts; Quantify water availability and soil moisture at field scales; improve climate impact crop models.

Next Steps: (in the context of EIS) Review project plan with Applied Ag program and Acres consortium; Collaborate on a workshop with key stakeholders to co-develop NLDAS-3 model for use in US Drought Monitor and OPenET products; Create user group to provide feedback on EIS Agriculture research.

EIS Engagements and Outreach in July

Organization/ Meeting	Date(s)/Location	Thematic Area	Outcome
Third OPERA Workshop	June 27, 2023	Water Security	Interaction with OPERA team at JPL developing operational satellite products that could benefit EIS
ESIP Annual Meeting	July 18-21, Burlington, Vermont	All	Scheduling meetings with DAACs to discuss data and cyberinfrastructure plans
Space for Ag Tour - Iowa Edition	July 24-27, Across Iowa	Ag, Water	Further identified farmer information needs; solidified relationships with key stakeholders; drafting project plans