

Opportunity Title: Southern Ocean - Antarctic Ice Sheet Interaction

Opportunity Reference Code: 0183-NPP-NOV23-JPL-EarthSci

Organization National Aeronautics and Space Administration (NASA)

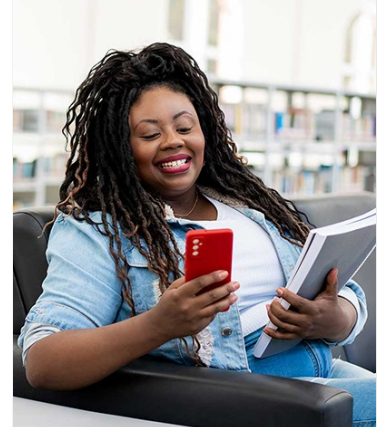
Reference Code 0183-NPP-NOV23-JPL-EarthSci

Application Deadline 11/1/2023 6:00:59 PM Eastern Time Zone

Description A research opportunity exists to investigate the interaction between the Southern Ocean and the Antarctic Ice Sheet using numerical ocean general circulation models and ocean state estimates. Research into the impact of Southern Ocean circulation and hydrographic variability on the melting of Antarctic ice shelves is fundamental for advancing our understanding of the observed dynamical changes taking place on the ice sheet and global sea level rise. Recent research has shown that variability in of the basin-scale circulation of Southern Ocean can impact how and where Circumpolar Deep Water (CDW) is brought to and across the shelf break to the ice shelf cavities. Interestingly, new model simulations suggest that the discharge of buoyant ice sheet meltwater can significantly modify the geostrophic circulation on the continental shelf and could therefore act as a negative feedback on ice sheet melt rates through the modification of the pathway and magnitude of CDW heat transport. At JPL we have developed global and regional ocean and sea-ice state estimates within the Estimating the Circulation and Climate of the Ocean (ECCO) framework. This research will leverage these global and regional ECCO state estimates, the adjoint of the ocean general circulation model (MITgcm), and our in-house expertise in setting up and running high-resolution ocean models. The ECCO state estimates will be used to analyze changes in the Southern Ocean circulation and hydrography in the vicinity of the Antarctic Ice Sheet over the past two decades. The adjoint of the MITgcm will be used to investigate cause-effect relationships between regional atmospheric forcing and ice sheet melt rates via their impact on CDW delivery to the ice shelf cavities. High-resolution forward ocean model simulations will be used to further investigate the dynamical processes responsible for CDW transport onto and across the continental shelf and within ice sheet cavities.

References:

Dutrieux, P. et al. Strong sensitivity of Pine Island ice-shelf melting to climatic variability. *Science* 343, 174-178 (2014). Rignot, E., Jacobs, S., Mouginot, J. & Scheuchl, B. Ice-shelf melting around Antarctica. *Science* 341, 266-270 (2013). Martinson, D. G. & McKee, D. C. Transport of warm Upper Circumpolar Deep Water onto the western Antarctic Peninsula continental shelf. *Ocean Sci.* 8, 433 (2012). Dinniman, M. S., Klinck, J. M. & Hofmann, E. E. Sensitivity of Circumpolar Deep Water transport and ice shelf basal melt along the west Antarctic Peninsula to changes in the winds. *J. Clim.* 25, 4799-4816 (2012). Nakayama, Y., Menemenlis, D., Schodlok, M. & Rignot, E. Amundsen and Bellingshausen Seas simulation with optimized ocean, sea ice, and thermodynamic ice shelf model parameters. *J. Geophys. Res. Oceans* 122, 6180-6195 (2017). Jacobs, S. S., Jenkins, A., Giulivi, C. F. & Dutrieux, P. Stronger ocean circulation and increased melting under Pine Island Glacier ice shelf. *Nat. Geosci.* 4, 519-523 (2011). Forget, G. et al. ECCO version 4: an integrated framework for non-linear



Whether you are just starting your career or already at a senior level, ORAU offers internships, fellowships, research opportunities, and contract positions that can provide you with invaluable experience. Download the ORAU Pathfinder mobile app and find the right opportunity to propel you along your career path!

Visit ORAU Pathfinder [↗](#)



Opportunity Title: Southern Ocean - Antarctic Ice Sheet Interaction

Opportunity Reference Code: 0183-NPP-NOV23-JPL-EarthSci

inverse modeling and global ocean state estimation. Geosci. Model Dev. 8, 3071-3104 (2015).

Location:

Jet Propulsion Laboratory
Pasadena, California

Field of Science:Earth Science

Advisors:

Ian Fenty
Ian.Fenty@jpl.nasa.gov
818-393-1506

Applications with citizens from Designated Countries will not be accepted at this time, unless they are Legal Permanent Residents of the United States. A complete list of Designated Countries can be found at: <https://www.nasa.gov/oiiir/export-control>.

Eligibility is currently open to:

- U.S. Citizens;
- U.S. Lawful Permanent Residents (LPR);
- Foreign Nationals eligible for an Exchange Visitor J-1 visa status; and,
- Applicants for LPR, asylees, or refugees in the U.S. at the time of application with 1) a valid EAD card and 2) I-485 or I-589 forms in pending status

Eligibility Requirements

- **Degree:** Doctoral Degree.