



Ice Sheet-Ocean Interactions - SIOC 225 - 4 Credits

Spring Quarter: T, Th 9:30-10:50 am, Location Eckart 236
Instructor: Prof. Fiamma Straneo

Rapid ice loss from Greenland and Antarctica has raised interest in ice sheet-ocean exchanges for two main reasons. First, increased submarine melting of glaciers and ice shelves has been identified as a trigger of ice loss. Second, the increased freshwater, and nutrient, discharge associated with ice loss has the potential to impact dense water formation, and hence the overturning circulation, as well as the regional marine ecosystems. Notwithstanding their importance ice sheet/ocean exchanges are poorly understood and not represented in climate models thus contributing to large uncertainties in sea level rise and climate projections.

This interdisciplinary course targets student studying or interested in the polar regions and in this new, relevant and growing field of research. By design, the course addresses the ice sheet margins through a system approach that includes the physical ocean, ocean biogeochemistry, marine ecosystems, the glaciers/ice sheets and the atmosphere. Students will gain experience in synthesizing knowledge across disciplines, science communication and will engage in a team or individual research project which will allow them to dig deeper in one topic of choice.

Requirements

While there are no required courses to participate in this class, some introduction to physical oceanography will be helpful. The course is designed for an interdisciplinary group of students.

Credit & Homework

Grades will be based on homework (20%), in-class participation (30%) and a final project + presentation (50%).

A syllabus is included (subject to change depending on student interest).

Please contact me at fstraneo@ucsd.edu for additional information.



Syllabus – Ice Sheet-Ocean Interactions in the Climate System

1. Ice Sheets in the climate system
 - Modern day and longer term variability in ice sheets and sea-level rise
 - Mass balance and mean hydrologic cycle

2. Physics of ice melting (and refreezing) in the ocean
 - Thermodynamics
 - Transformation of ocean waters
 - Plumes

3. Observations and modeling of ice/ocean exchanges

4. Greenland and the ocean
 - Ocean circulation around Greenland
 - Freshwater fluxes from the ice to the ocean
 - Tidewater glaciers and floating ice tongues, fjords

5. Antarctica and the ocean
 - Southern Ocean and shelf circulation
 - Freshwater fluxes from the ice to the ocean
 - Ice shelves and ice cavities

6. Marine Ecosystems at the Ice/Ocean Margins
 - discharge of nutrients, sediments and upwelling of nutrients

7. Icebergs

8. Energy exchange the ice-sheets/ocean/atmosphere