

IPY: Flow Dynamics of Two Amundsen Sea Glaciers: Thwaites and Pine Island

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Relevance to IPY: One of three main areas of emphasis for US scientists during the International Polar Year (IPY) is "Ice Sheet History and Dynamics." We propose to address that theme on the Thwaites Glacier and Pine Island Glacier in the Amundsen Sea sector of the West Antarctic Ice Sheet. Our work will have greater impact because of the international collaboration that we have established with the British Antarctic Survey: working together, we can conduct a fuller suite of geophysical experiments in one season with more-efficient use of people and logistics than we could individually. This project is one of half-a-dozen proposals to characterize the Amundsen Sea Embayment, which has been identified in numerous planning documents as perhaps the most important target for ice-dynamical research. Taken together, this "pulse of activity" will result in a better understanding of this important part of the global system. Finally, we will "engage the public in polar discovery" with a unique set of audio and video field-podcasts, which will put a public-outreach umbrella over a number of IPY projects (see attached letters of support).

Intellectual Merit: This proposal addresses a number of questions listed in the NSF solicitation, including the first-listed one: What are the critical boundary conditions for development of comprehensive predictive models of ice sheet behavior? We propose a field season during which we will measure the subglacial environment of Thwaites and Pine Island Glaciers using three powerful, but relatively simple tools: reflection seismic imaging, GPS motion monitoring of the tidal forcing, and passive seismic monitoring of the seismicity associated with motion. The results of the field work will feed into ice-sheet modeling efforts that are tuned to the case of an ocean-terminating glacier. Taken together, we will assess the influence of these glaciers on current sea level and project into the future. We will also assess the role of Thwaites Glacier as a "lynchpin" of the Amundsen Sea sector of the West Antarctic Ice Sheet and whether it is uniquely vulnerable to abrupt drawdown and discharge of water in the future.

Broader Impacts: In addition to the science program, we are proposing an informal-education and public-outreach effort that is an umbrella over many, if not all, of the IPY Ice Sheet Dynamics-themed science projects. Penn State Public Broadcasting (PSPB) has partnered with us in offering a series of weekly podcasts from the field that will trace an arc through ice sheet dynamics. We refer to each week's product as an "episode" (e.g, ice-core science, surface glaciology, geology, etc.), which will be broken up into three or four segments of, e.g., primary science, background science, meet-the-scientist, and science-for-kids.

Every week a different field team will host the podcast crew (our field team some weeks, and other IPY-participant field teams other weeks---see attached letters of support) allowing the podcast episodes to cover a range of subjects, field environments, personalities, and viewpoints. The hosts of all the episodes will be a Penn State professor of science education and a science reporter at PSPB. The tight coupling of the media and science teams will result in accurate, timely, and focused reporting.