PREFACE

This issue of the *Annals of Glaciology* contains a wide range of papers highlighting the latest results in a topical interdisciplinary research area straddling glaciology and oceanography: *Interaction of glaciers and ice sheets with the ocean.* Recent observations have shown that major changes in ice sheets and glaciers, such as rapid ice shelf loss and rapid tidewater glacier retreat, may be due to ocean variability. The mass balance of the Antarctic and Greenland ice sheets and the dynamics of the adjacent oceans may be coupled through physical processes occurring at ice–ocean interfaces.

Recent observations of rapidly thinning outlet glaciers and collapsing ice shelves increased scientific interest in quantitative understanding of ice–ocean interactions (e.g. Scambos and others, 2000; Howat and others, 2005; Rignot, 2002). Ice shelves have been shown to influence the flux of grounded ice across the grounding line, and thinning ice shelves appear to be driving most of the mass loss from Antarctica (Pritchard and others, 2009, 2012). Improved understanding of these processes is essential for predicting how ice sheets and glaciers evolve under changing climate and impact global ocean circulation and eustatic sea level.

Papers included in this *Annals of Glaciology* issue span a wide range of spatial scales, from borehole observations (Hubbard and others) to continent-scale ice sheet models (Sato and Greve). Several of the more technique-oriented publications focus on applying relatively new approaches to investigating ice–ocean interactions at high temporal resolution. Particularly innovative is the use of underwater acoustic sensors to monitor calving processes (Pettit). This work represents an extension of the growing use of seismic techniques in investigating glacier processes, particularly calving (Amundson and others, Freed-Brown and others, Walter and others). The latter paper utilizes ground-based time-lapse photography to support interpretation of seismic data. Quantitative interpretation of time-lapse photography is also used by Rivera and others to document a recent acceleration and retreat of a major Patagonian tidewater glacier.

Dynamic behavior of marine-terminating glaciers in Greenland is the subject matter of several papers in this volume. Bevan and others highlight a Greenland tidewater glacier whose dynamics remained relatively stable over a few decades in spite of a thinning trend. An accelerating retreat of the Geikie Plateau glacial system is documented by Jiskoot and others for a period of over 20 years. Walter and others and Christoffersen and others use field data to analyse whether dynamics of Greenland outlet glaciers are driven more by atmospheric or oceanographic forcings while Rignot and others use output from ocean circulation simulations to argue that the recent acceleration of many Greenland outlet glaciers was triggered by spreading of warm ocean waters. In a related modeling study, Xu and others explore the sensitivity of subaqueous ice-melting rates to ocean water temperatures and subglacial meltwater inputs. On the ocean side of Greenland, Sutherland and Straneo as well as Straneo and others report on oceanographic measurements of fjord water properties, including estimates of ocean heat fluxes towards glacier fronts.

Basal melting of ice shelves is the major focus of papers treating ice–ocean interactions in Antarctica. A particular geographic focus is on the ice shelf of Pine Island Glacier, where large changes have been observed over the past decade. Mankoff and others propose that meltwater plumes

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traveling beneath this ice shelf carve large channels into its underside. Meltwater flow in these channels is vigorous enough to bring relatively warm water to the ice shelf front (see the cover image for this volume). Two modeling studies investigate the sensitivity of the Pine Island ice shelf to uncertainties in the geometry of ice-shelf cavity (Schodlock and others) and to ocean thermal forcing. Steig and others put the recent changes in the Amundsen Sea Embayment into global climate perspective and propose a tropical forcing for the incursion of relatively warm circumpolar deep water into the shallow parts of the Embayment.

The three dozen strong papers being published in this thematic volume of *Annals of Glaciology* demonstrate the considerable depth of scientific interest in ice–ocean interactions. This topic is likely to grow in prominence to glaciology and polar oceanography in the foreseeable future, several decades after the instability of marine ice sheets and tidewater glaciers became important targets of polar research (e.g. Mercer, 1978; Meier and Post, 1987).

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Slawek Tulaczyk

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