Sea-swell interaction with ice shelves: Observations at a site on the Ross Ice Shelf and a model of swell-excited ice-shelf vibration

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It has been shown that storm events in the far field, e.g., in the tropics, and as far away as the high latitudes of the opposite hemisphere, are observable in seismic signals recorded on icebergs and ice shelves as well as at long-term land-based seismic stations (MacAyeal et al., in press; and Wadhams et al., 1983). Previous studies have observed the motion and induced stresses on small tabular icebergs and have suggested that sea swell is a mechanism capable of breaking up icebergs (Wadhams et al., 1983; Holdsworth and Glynn, 1978). This study presents data collected using broad-band seismometers installed at various locations on the Ross Ice Sheet. One seismometer location, called Nascent Iceberg, is expect calve and become another large tabular iceberg as a result of a large rift that currently is propagating parallel to the icefront, about 30 km back. Another seismometer is located near Scott Base, on the McMurdo Ice Shelf. This second site offers the opportunity to calibrate the “microseism” observations of the land-based seismometer so that it can be used to extend the observation of sea swell influences on the Ross Ice Shelf to times prior to seismometer deployment, e.g., to the time when B15 and other icebergs originally calved. We will describe the motion of the ice shelf during the 2004 and 2005 austral summer, and correlate the observed motion to size, duration and distance of far-field storm events. If sufficient progress permits, we will also present the results of finite-element modeling of sea-swell/ice-shelf interaction that addresses the possible influence of swell in the calving process.