313

AN AEROGEOPHYSICAL COMPARISON OF A LARGE TABULAR ICEBERG AND THE ICE TONGUES AND GROUNDING ZONES OF THWAITES GLACIER AND SMITH GLACIER, AMUNDSEN SEA EMBAYMENT, WEST ANTARCTICA

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Exposed grounding lines abutting Antarctica's relatively warm Amundsen Sea may represent an important locus of ice sheet erosion. Recent satellite remote sensing has indicated both expansion and retreat of active grounding lines in the region, with implications for global sea level change. As part of the 2004/05 AGASEA project, the University of Texas Institute for Geophysics (UTIG) surveyed Thwaites Glacier and Smith Glacier, two major marine outlet glaciers on the Amundsen Sea coast, using an aerogeophysical platform configured for simultaneous glaciological and geological investigations. Also surveyed in 2001 and again in 2004 was the large tabular iceberg B15A, in the Ross Sea. The primary glaciological tools were a high-power coherent radar sounder and a laser altimeter, positioned by dual carrier phase GPS. Coverage of the Thwaites Glacier grounding line includes 12 radar and laser altimetry profiles collected by UTIG, and two radar profiles collected by the British Antarctic Survey. Grid spacings for Thwaites Glacier were ~15km. The Smith Glacier grounding line location is constrained by two converging longitudinal profiles and three transverse lines at 15 km spacing, all five of which are UTIG radar and laser altimetry profiles. Surface elevations and ice thicknesses were derived from these data. These laser/radar profiles allow us to analyze buoyancy across the Smith Glacier and Thwaites Glacier grounding line zones. The repeated synoptic survey of B15 serves to calbrate our system on a floating ice body simpler than a glacial ice tongue. We use laser altimetry and the GGM02 geoid model to establish local sealevel to within a meter, and using this reference and modeled firn structures, predict from glacier surface elevations apparent hydrostatic compensation depths. We compare this result to published tidal hinge lines delineated by satellite-based interferomic imaging radar between 1992 and 2000. We find that the main trunk of Thwaites Glacier floats at a relatively shallow depth, and a broad lateral sill appears to localize the grounding line. Smith Glacier has a deep grounding line, but is pinned downstream.