Aeromagnetic results from the Thwaites Glacier catchment, West Antarctica

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The glaciers of the Amundsen Sea Embayment (ASE) have become a focus for integrated studies by both the U.S. and European scientific communities due to satellite observations of non-steady behavior and the ASE's dominant role in WAIS mass balance. In order to accomplish some of the primary objectives of the Amundsen Sea Embayment Science Plan and to guide future surface-based research, the University of Texas (UT) and the British Antarctic Survey (BAS) undertook a comprehensive aerogeophysical survey encompassing the two major drainage basins within the Amundsen Sea Embayment - Pine Island and Thwaites glaciers. This survey was conducted during the 2004/05 austral summer, operating from two remote field camps and using two survey aircraft.

The multidisciplinary nature of coupled lithosphere and ice sheet studies requires a broad approach for which multi-instrumented airborne surveys are well suited. Radar sounding data were acquired to determine bed morphology and ice thickness [Holt et al., 2006; Vaughan et al., 2006], necessary to calculate ice sheet driving stress and hydrologic potential. Gravity and magnetics data were collected to help identify crustal blocks, sedimentary basins, volcanic activity, and to characterize geothermal flux, all of which are critical to models of ice sheet dynamics. Laser surface elevations were acquired to enable detailed mass balance calculations and satellite altimeter calibrations.

This presentation describes aeromagnetics results for the Thwaites catchment acquired by UT. Over 43,500 line-km of total-field aeromagnetic data were acquired with a towed Geometrics cesium magnetometer. Geometrics cesium base station magnetometers acquired data for diurnal variations of the geomagnetic field. Due to the gridded nature of the survey, crossovers were plentiful providing the means to remove diurnal variations far from the base stations. Data reduction included base station and IGRF corrections followed by leveling.

Although the Thwaites catchment is dominated by an erosional landscape [Holt et al., 2006], the underlying crustal structure may have a strong influence on the distribution of geothermal flux and hence, ice dynamics. Previous studies indicate a general scenario of geologic complexity, with the deep Byrd Subglacial Basin tenuously connected to the West Antarctic Rift System and bounded by the Marie Byrd Land volcanic province to the northwest and the Thurston Island Ellsworth/Whitmore blocks to the northeast and east, respectively [Dalziel and Elliot, 1982; Behrendt et al., 1992; Dalziel and Lawver, 2001]. The aeromagnetic data will enable better delineation of subglacial geology in the Thwaites catchment than previously possible, especially when combined with radar

sounding and aerogravity results. These new data will contribute to improved constraints on important basal boundary conditions needed for modeling ice dynamics in the Amundsen Sea Embayment.

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