

AIRBORNE GRAVITY RESULTS, INTERPRETATIONS, AND COMPARISON WITH SATELLITE GRAVITY FOR THE THWAITES GLACIER CATCHMENT, AMUNDSEN SEA EMBAYMENT, WEST ANTARCTICA

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As the climate warms, the potential for rapid discharge of the West Antarctic Ice Sheet grows, especially in the Amundsen Sea Embayment (ASE). The ASE contains two of the fastest moving and most susceptible outlet glaciers in West Antarctica: Thwaites and Pine Island Glaciers. However, boundary conditions that affect the flow of these glaciers— such as sediment distribution and bedrock characteristics— have been previously unknown and, therefore, are inaccurate in current ice flow models of the catchments. In order to provide better constraints, the University of Texas (supported by NSF) conducted an airborne survey of the Thwaites Glacier catchment during the 2004-2005 austral summer. Our survey is the first and only large-scale geophysical survey of this area. Over 43,500 line-km of data were collected with an aerogeophysical platform that included ice-penetrating radar, gravity, magnetics, laser and pressure altimetry, and GPS. This was the first use of a LaCoste & Romberg Air/Sea II gravimeter in an airborne survey.

Here we present the resultant free-air and Bouger gravity anomalies; we also make initial interpretations and compare the best extant satellite gravity anomalies to the airborne ones. Altitude changes due to survey design and weather conditions produced considerable aircraft motion during data acquisition. Horizontal accelerations are manifested in the vertical gravity measurement due to significant tilt of the gravity meter's platform. We will discuss the method used for reducing the effects of platform tilt. We assess the theoretical anomaly detection threshold, actual anomaly resolution, and data error. Interpretations of the free-air and Bouger anomalies allow us to estimate sediment thicknesses and identify structural/tectonic bedrock features. The best satellite gravity free-air anomaly map of the Thwaites Glacier catchment compares unfavourably with the long-wavelength airborne results. This highlights the need for using satellite and airborne gravity measurements in tandem and/or for significantly improving satellite gravity measurements.