

NEW INSIGHTS INTO THE THWAITES GLACIER SYSTEM FROM A COMPREHENSIVE AEROGEOPHYSICAL SURVEY OF THE AMUNDSEN SEA EMBAYMENT, WEST ANTARCTICA

J.W. Holt¹, D.D. Blankenship¹, D.L. Morse¹, D.A. Young¹, M.E. Peters¹, D.G. Vaughan², H.F.J. Corr²

¹*University of Texas Institute for Geophysics, Jackson School of Geosciences, Austin, Texas, United States,* ²*British Antarctic Survey, Cambridge, United Kingdom*

The first comprehensive look at subglacial topography beneath the Thwaites Glacier catchment and its surroundings comes from an aerogeophysical survey of the Amundsen Sea Embayment (ASE) conducted in the austral summer of 2004-2005 by the University of Texas Institute for Geophysics (UTIG) and the British Antarctic Survey (BAS). Both groups used Twin Otter platforms outfitted with ice-penetrating radar, gravimeter, and magnetometer. UTIG also included a fixed laser altimeter. Carrier-phase GPS receivers provided data for precise positioning. UTIG's results over the Thwaites catchment reveal that Thwaites Glacier is underlain by a single, broad basin fed by a dendritic pattern of extensive valleys, in contrast to BAS's results over Pine Island Glacier showing its confinement to a deep, narrow trench and topographic separation of its catchment into two basins. New estimates of ice volume indicate a potential sea level rise of 59 cm for the Thwaites Glacier catchment. The lack of topographic confinement along the Thwaites Glacier trunk's eastern margin implies that possible recent widening in response to grounding line retreat could continue. Smith, Pope, and Kohler Glaciers converge just west of Thwaites Glacier to flow through an extremely deep, narrow trench that is up to 2 km below sea level. Subglacial topography in the Thwaites Glacier catchment slopes inland from a broad, low-relief coastal sill to the thickest ice of the WAIS and makes deep connections to both Pine Island Glacier's southern catchment and the Ross Sea Embayment. This geometry could enable dynamic interactions across the WAIS during deglaciation leading to the loss of more ice than held in the Thwaites catchment alone. Simple isostatic rebound modeling shows that most of this landscape would be submarine after deglaciation, aside from an island chain near the present-day Ross-Amundsen ice divide. During the growth of the West Antarctic Ice Sheet, this island chain could have facilitated the connection of nucleating ice caps on the neighboring highlands in Marie Byrd Land and the Ellsworth-Whitmore Mountains.