

GIMBLE: Geophysical Investigations of Marie Byrd Land Evolution: a new airborne survey of the linchpin of the West Antarctic Ice Sheet

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The Marie Byrd Land crustal block is the linchpin of the West Antarctic Ice Sheet, and has been an important geological target for its record of the evolution of the Mesozoic Antarctic margin, Cenozoic volcanism, and potential Neogene doming. However, despite significant geological expeditions and POLENET efforts, no comprehensive aerogeophysical efforts have targeted the dome of Marie Byrd Land itself. A number of contesting hypotheses for the origin of Marie Byrd Land make predictions for the potential fields and the geomorphology of the underlying crust: that overlies an active mantle hotspot; that it represents the rift flank of an ancestral West Antarctic Plateau; or that it represents large scale dynamic topography related to Gondwana margin evolution.

We have proposed to perform a 16 flight, two year aerogeophysical survey of Marie Byrd Land with 4 key datasets: gravity, magnetics, radar data and laser altimetry. Gravity with collocated radar will be used to constrain the compensation state of Marie Byrd Land, leveraging NSF's investment in the POLENET project; magnetics will be used to assess the potential for ongoing sub ice volcanism (and thus qualitatively assess heat flow); and ice penetrating radar will be used to map out at 5-km resolution the topography of the interior slope of Marie Byrd Land's bedrock, to understand the evolution of erosion and thus regional topography. Laser altimetry will help constrain the state of Marie Byrd Land's outlet glaciers.

In this poster, we describe the plans for the coming season, and how they will be meshed with concurrent Ice Bridge operations. This work is supported by NSF's OPP, NASA's Operation Ice Bridge, and the Australian Antarctic Division.