

Deep troughs dissect the Marie Byrd Land subglacial highland: Initial results of the GIMBLE survey

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Due to its high relief and potential evolution over the Cenozoic, the subglacial highland underlying coastal Marie Byrd Land plays a critical role in the architecture of the West Antarctic Ice Sheet. This enigmatic region records of the extension of the West Antarctic Rift System and may potentially host elevated heat flow due to a proposed sub-lithospheric hotspot. The GIMBLE (Geophysical Investigations of Marie Byrd Land Evolution) project will span two field seasons and is designed to understand the origin and evolution of the Marie Byrd Land subglacial highland. GIMBLE has migrated the DC-3T aerogeophysical platform developed for the East Antarctic ICECAP project to West Antarctica, operating from Byrd Surface Camp. Data collected include magnetics, coherent radar, gravity, and laser altimetry. GIMBLE conducted four survey flights from Byrd Surface Camp toward the coast during late January 2013 to gain a reconnaissance view of the region. Further flights are planned for 2014-15 to provide a high-resolution view of the southern margin of the highland. Initial results indicate that the core of the highland is in fact deeply dissected, with at least one major submarine valley connecting DeVicq Glacier directly to the interior of the West Antarctic Ice Sheet. Other major valleys extend from the Flood Range to the coast, and cut the southern margin as well. The deep ice in these valleys (with depressed pressure melting points) and the high heat flow implied by evidence of local volcanism could provide an additional source of subglacial melt water to both the grounding line and the interior of the West Antarctic Ice Sheet.