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Evidence for heterogeneous (and possibly transient) geothermal flux beneath the Ross-Amundsen ice divide of the West Antarctica ice sheet

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The geological framework for the evolution of the marine-based West Antarctic ice sheet (WAIS) is the Cretaceous through Cenozoic rifting of the underlying lithosphere. The southern flank of this rift, along the Whitmore Mountains, underlies the upper reaches of the Ross Sea catchment of the WAIS and has been identified as a site of active subglacial volcanism. On the other hand, the northern flank of this rift, represented by the upward doming of the Marie Byrd Land volcanic province, has not yet been associated with active subglacial volcanism. Also, it is not known whether the heterogeneity of geothermal flux associated with these rift flank volcanic provinces extends across the floor of the rift between the rift flanks.

Here we present geophysical evidence for heterogeneous geothermal flux associated with active subglacial volcanism along the northern rift flank adjacent to Marie Byrd Land where it intersects the ice divide for the Ross and Amundsen Sea sectors for the WAIS. We further evaluate the evidence for the continuity of heterogeneous geothermal flux along this ice divide and across the rift floor between the two flanks of the West Antarctic rift system.

Keywords: Antarctica, subglacial volcanoes, geothermal heat flux, ice sheets.