Origin and Cause of Melting Beneath East Antarctica

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The southernmost volcanoes on Earth, Mt. Early and Sheridan Bluff, are two basaltic monogenetic volcanoes located 87°S at the head of the Scott Glacier. The basalts range from alkaline (~6 wt.% *Ne*-normative) to transitional and subalkaline tholeiite (~6 wt.% *Hy*-normative). The Early Miocene volcanoes lie ~1000 km from any other volcano and ~200 km from the shoulder of the West Antarctic Rift System (WARS). WARS is part of a larger diffuse alkaline magmatic province (DAMP) that includes volcanism in New Zealand and Australia [1].

Major and trace elements of basalt from Early/Sheridan are compared to DAMP to test their affiliation and to understand the source and cause of melting beneath East Antarctica. Our results show that Early/Sheridan basalt, especially tholeiite, are distinct, having lower Ce/Pb (≤ 20), Gd/Yb (≤ 3) and lack K and Pb anomalies on normalized multi-element plots. Negative K anomalies are a prominent feature of DAMP basalt and are used to support amphibole-rich lithospheric sources [2]. Given the geochemical differences it is likely that the basalts at Early/Sheridan were derived from asthenosphere with little or no input from mantle lithosphere. Another distinctive feature is the synchronicity of alkaline and tholeiitic basalt at Sheridan which is uncommon in DAMP. Modelling indicates that the two magma series are not related by differentiation processes (*i.e.* fractional crystallization and/or assimilation) but are most likely due to different degrees of partial melting, possibly of a common source, where tholeiite is produced by higher degree melts at shallower depths. A viable mechanism for this may be lithospheric delamination, which is proposed for this region based on geophysical evidence [3], placing Early/Sheridan directly above a shallow (50-80 km) low velocity zone.

[1] Finn *et al*. (2005), *G*^{3}, doi:10.1029/2004GC000723; [2] Panter *et al*. (2008), *Journal of Petrology*, doi:10.1093/petrology/egy036; [3] Shen *et al*. (2017), *Geology*, doi:10.1130/G39555.1