St. Helena type HIMU plume involved in Zealandia-Antarctica breakup

K. HOERNLE[1], C. TIMM[1,2], F. HAUFF[1], V. TAPPENDEN[3], R. WERNER[1], E. M. JOLIS[1], N. MORTIMER[4], S. WEAVER[3], F. RIEFSTAHL[5], K. GOHL[5]

[1]GEOMAR, Helmholtz Center for Ocean Research Kiel, Germany (*correspondence: khoernle@geomar.de)
[2]GNS Science, Lower Hutt, New Zealand
[3]Canterbury University, Christchurch, New Zealand
[4]GNS Science, Dunedin, New Zealand
[5]Alfred Wegener Institute Helmholtz Center for Polar and Marine Research, Bremerhaven, Germany

A major global plate tectonic reorganization (~105-100 Ma) has been postulated to have been initiated by subduction cessation at the Zealandia Gondwana margin (Matthews et al., 2012; EPSL355–356: 283–298). Here we report new comprehensive geochemical data for Late Cretaceous (99-69 Ma) intraplate volcanism from four geographically-separated provinces suggesting the involvement of a mantle plume in this event. The igneous provinces include: 1) the Hikurangi Seamount Province (99-86 Ma), 2) Marlborough Igneous Province (98-94 Ma), South Island of New Zealand, 3) Westland Igneous Province (92-69 Ma), South Island, and 4) Eastern Chatham Igneous Province (86-79 Ma). Each of the provinces forms binary mixing arrays on incompatible-element and isotope ratio plots between HIMU and either a depleted (MORB-source) upper mantle (DM) component or enriched continental (EM) type component (located in the crust and/or upper mantle) or a mixture of both. St. Helena end member HIMU is the common component in all four provinces, despite the variable lithosphere (continental, oceanic, oceanic plateau) beneath the magmatic provinces, pointing to a common sublithospheric (mantle plume) source. We conclude that both Hikurangi Plateau collision, resulting in subduction cessation, and the opening of slab tears and/or windows, allowing hot asthenosphere and plume material to upwell to shallow depths, were important in causing the breakup of Zealandia from West Antarctica.