Enriched mantle component in high Sr/Y (“TTG”) granites: Hf, Sr, Nd, O, isotopic compositions of Cretaceous arc magmas from New Zealand

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High Sr/Y plutonic rocks (HiSY, TTG, adakitic) form significant components of continental margin magmatism. Some are associated with major flare ups in rates of magmatism. Jurassic-Early Cretaceous subduction along the NZ segment of east Gondwana produced margin-parallel paired belts over at least 800 km: an inboard high Sr/Y (>40) SPS belt (130-105Ma) immediately postdates an outboard, low Sr/Y, Darran belt (170-128 Ma) [1].

A Sr-Nd isotope array for SPS [2] extending steeply below the mantle array from the near-DM Darran field (eNd=+3.5 to 0.7) was interpreted as including a low-Rb/Sr basaltic component with a significant but limited prehistory (?Darran belt). Partial melting of an underplated and/or underthrust Darran belt has also been suggested to explain the high Sr/Y, and the inboard location [2, 3, 1].

We report new Hf isotope data for SPS (eHf=3.9 to 7.5) that require a more enriched component, with lower eHf, in addition to a Darran component (eHf= 9.8) (or oceanic crust/ lithosphere). Qtz, zircon & opx ^{18}O (calculated WR = 4.8-7.6 per mil) and feldspar Pb isotopic data rule out significant continental crust, and pelagic sediment (low Sr_i rules out EMII), pointing instead to EMI enriched mantle. A significant mantle component is also required to supply heat to drive the observed SPS flare up.

References

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