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The Origin of Intraplate Volcanism on Zealandia

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The origin of intraplate volcanism on continents is generally attributed to mantle plumes or continental rifting. Widespread intraplate volcanism has occurred on the primarily submarine New Zealand micro-continent Zealandia almost continuously since its separation from Gondwana approx. 100 Ma ago. This volcanism cannot be directly related to continental rifting and occurred during local periods of both extension and compression. The lack of extended volcanic belts with age progressions in the direction and at the rate of plate motion is not consistent with the plume hypothesis. Voluminous HIMU-type volcanism was associated with the Cretaceous rifting of Zealandia from Gondwana, consistent with suggestions that a mantle plume or plume head may have been involved in causing the separation of Zealandia from Gondwana (Story et al., 1999). After the "break-up" $\sim$84 Ma ago, Zealandia drifted $\sim$6,000 km to the NW. In contrast, lower volumes of eruptives were produced in the Cenozoic. Most mafic (MgO $>$ 5 wt%) Cenozoic lavas define an array between the Cretaceous HIMU-type lavas and Pacific MORB on Sr, Nd, Pb and Hf isotope correlation diagrams, suggesting the involvement of the residual HIMU-type plume-type material and the depleted MORB source. Seismic tomography reveals a large low-velocity (presumably hot) body beneath the Chatham Rise between 600 and 1450 km depth, which can be traced beneath Antarctica (Montelli et al., 2006). We propose that the deep-seated thermal anomaly caused the final continental break-up of Gondwana and could still contribute to post-breakup volcanism on Zealandia, possibly in the form of small, short-lived up-

wellings similar to those that have been imaged beneath Central Europe (e.g., Granet et al., 1995). A possible mechanism for triggering such upwelling may be lithospheric detachment (Hoernle et al., 2006).

References:

1) K. Hoernle et al., 2006. EPSL, 248, 335-352.

2) R. Montelli et al., 2006. G3 7, Q11007, doi:10.1029/2006GC001248.

3) M. Granet et al., 1995. EPSL, 136, 281-296