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Enhanced subduction flux during the assembly of Pangea recorded by global intracontinental magmatism

Qian Chen[1,2,3], He Liu[1,2], Andrea Giuliani[4], Tim Johnson[3], Luc Doucet[3], Lipeng Zhang[1,5], and Weidong Sun[1,2,5]

[1]Institute of Oceanology, Chinese Academy of Sciences, Qingdao, China
[2]University of Chinese Academy of Sciences, Beijing, China
[3]School of Earth and Planetary Sciences, Curtin University, Perth, Australia
[4]Institute of Geochemistry and Petrology, ETH Zurich, Zurich, Switzerland
[5]Deep-Sea Multidisciplinary Research Centre, Laoshan Laboratory, Qingdao, China

Plate tectonics drives the compositional diversity of Earth's convecting mantle through subduction of lithosphere. In this context, the role of evolving global geodynamics and plate (re)organisation on the spatial and temporal distribution of compositional heterogeneities in the convecting mantle is poorly understood. We test the hypothesis that an increase in the cumulative length of subduction zones associated with supercontinent assembly triggered geochemical enrichment of the convective mantle globally, in particular since the emergence of protracted, cold, deep subduction in the late Neoproterozoic. We compiled the trace element and Nd isotopic compositions of intracontinental basalts formed over the last billion years (1000 Myr). After careful filtering to eliminate samples with evidence for crustal contamination, the data show that intracontinental basalts formed before 300 Ma exhibit supra-chondritic initial $^{144}Nd/^{143}Nd$ values. Those with sub-chondritic initial $^{144}Nd/^{143}Nd$ values become common only after 300 Ma, broadly coeval with the global appearance of kimberlites with geochemically enriched isotopic signatures. We attribute these step-changes in the sources of intraplate magmatism to a rapid increase in the supply of deeply subducted lithosphere due to increased peri-continental subduction during the assembly of Pangea.