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TITLE: Melting of the oceanic crust in the stagnant slab at the mantle transition zone: constraints from alkaline basalts in eastern China

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SESSION TITLE: T44D. The Origin of Intraplate Volcanism: Hotspots, Nonhotspots, and Large Igneous Provinces II

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ABSTRACT BODY: Cold oceanic plates, which include igneous and sediment layers, start sinking along subduction zones. The layers dehydrate and melt as they undergo subduction, which feeds slab components to arc magmas. After it has been subducted, the remaining slab stagnates in the mantle transition zone (at depths of 400 - 660 km), where the minerals undergo pressure-induced transformations, and the resulting density turnover prevents further slab penetration and instead it stagnates. Experimental data predict that the stagnant slab melts due to conductive heating from the ambient mantle and then the residual slab becomes dense and can sink deeper.

Here we present evidence that melts from the igneous layers in the stagnant Pacific plate slab have contributed to the source composition of basalts erupted in eastern China. Within the Cenozoic basalts of eastern China there is a zone of SiO_2-poor basalts extending N-S at approximately 119 °E between 26 and 41 °N. New geochemical data from Cenozoic alkaline basalt lavas in the Shandong area, which is within this zone, also reveal low SiO_2 (<44 wt%) and high FeO* (>13 wt%). In addition, the Shandong basalts have distinctive trace element patterns. Multi element plots (normalized to the primitive mantle) show that they commonly have convex-up patterns with depletions in Rb, Ba, Pb relative to other large ion lithophile elements and light rare earth elements, and to a lesser extent, depletions in Zr and Hf relative to middle rare earth elements, which is similar to those of the OIBs with HIMU isotopic signatures. However, in contrast to HIMU basalts, the radiogenic isotope compositions (Nd-Sr-Pb) of the Shandong basalts suggest that they were derived from a depleted mantle source rather than a HIMU mantle source. Nd-Hf isotope compositions form a mixing trend between Indian and Pacific mantle domains. The most Si-deficient Shandong basalts, which also have high Ce/Pb, plot at the most radiogenic end of the εNd-εHf array, closest to the Pacific mantle domain.

Seismic tomography shows that the zone of SiO_2-poor Cenozoic basalts, including Shandong, in eastern China is located above the western leading edge of the stagnant slab of the Pacific plate, which extends N-S along 119°E. The geochemical characteristics of the SiO_2-poor basalts,

particularly those of Shandong, lead us to conclude that the source of these basalts includes a strong contribution from melts generated at the leading edge of the stagnant slab of the Pacific plate. These melts are derived from the melting of dehydrated carbonate-bearing igneous layers at the leading edge of the stagnant slab.

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