Lead isotope constraints on the nature of crustal components in the mantle source of Cenozoic continental basalts from eastern China

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Cenozoic continental basalts in eastern China are characterized by OIB-like trace element patterns and significantly depleted to moderately enriched Sr-Nd isotope compositions. While these enriched geochemical signatures are attributable to contributions from subducted oceanic crust to the mantle sources, basalt Pb isotope variations themselves have remained enigmatic with respect to their origin. This study attempts to link the Pb isotope compositions to the other geochemical variables. The results provide insights into the nature of crustal components in the mantle sources of these basalts. We distinguish three crustal components in addition to the depleted MORB mantle. The three crustal components were derived from partial melting of igneous oceanic crust (IOC), lower continental crust (LCC) and seafloor sediment (SS), respectively. The relatively high $^{206}Pb/^{204}Pb$ and low $\Delta 8/4$ ratios are ascribed to the IOC component that was originated from the altered oceanic basalt with high U/Pb and low Th/U ratios. The low $^{206}Pb/^{204}Pb$ and high $\Delta 8/4$ ratios are ascribed to the LCC component that was originated from offscrapped continental margin due to subduction of the oceanic slab. The SS component is originated from seafloor sediment but in different proportions between terrigenous sediment, pelagic sediments and marine carbonate. Based on the enrichment of LILE and LREE in the basalts, it is inferred that their mantle sources were generated by reaction of the depleted MORB mantle with the three crustal components, respectively, at the slab-mantle interface in oceanic subduction channel. Thus, the depleted MORB mantle would have served as the mantle wedge overlying the subducting oceanic slab for the crust-mantle interaction. This would be realized by westward subduction of Pacific slab beneath eastern China continent, which would not only lead to replacement of the cratonic mantle by the juvenile lithospheric mantle but also incorporation of the crustal components into the mantle sources of continental basalts.