Research Highlights

Non-plume hypothesis for the genesis of passive continental margin ocean island basalts

The genesis of Ocean Island Basalt (OIB) has been debated for more than four decades, and the model that is most accepted is the whole-mantle convection theory.

However, the lack of a clear age progression within volcanic chains for the OIB at the western offshore of West Africa—one of the major OIB regions on Earth—is inconsistent with the formation of hotspot tracks by melting of stationary plumes.

Iyasu G. Belay and colleagues at Okayama University measured isotopic data on Sr, Nd, Hf, and Pb for basaltic samples from the Cameroon Volcanic Line (CVL) volcanoes and found that they were generated by a mixture of the refertilized subcontinental lithospheric mantle and the asthenospheric mantle.

To decipher the common source materials of the OIB in the western offshore of West Africa, the principal component analysis was performed using the analyzed and the compiled data from Canary Islands, Cape Verde Islands, Madeira Islands, Atlas Mountains, and CVL volcanoes.

The researchers found that the parental magmas of most of the OIB studied were generated from the same materials for CVL, and their locations were strongly controlled by the former location of the Mesozoic rift axis when the African and South American continents broke up.

The genesis of OIB at the passive continental margin could be triggered by a small-scale convection beneath the discontinuous lithosphere-asthenosphere boundary, and a plume rising from the lower mantle is not necessary for the generation of these magmas.

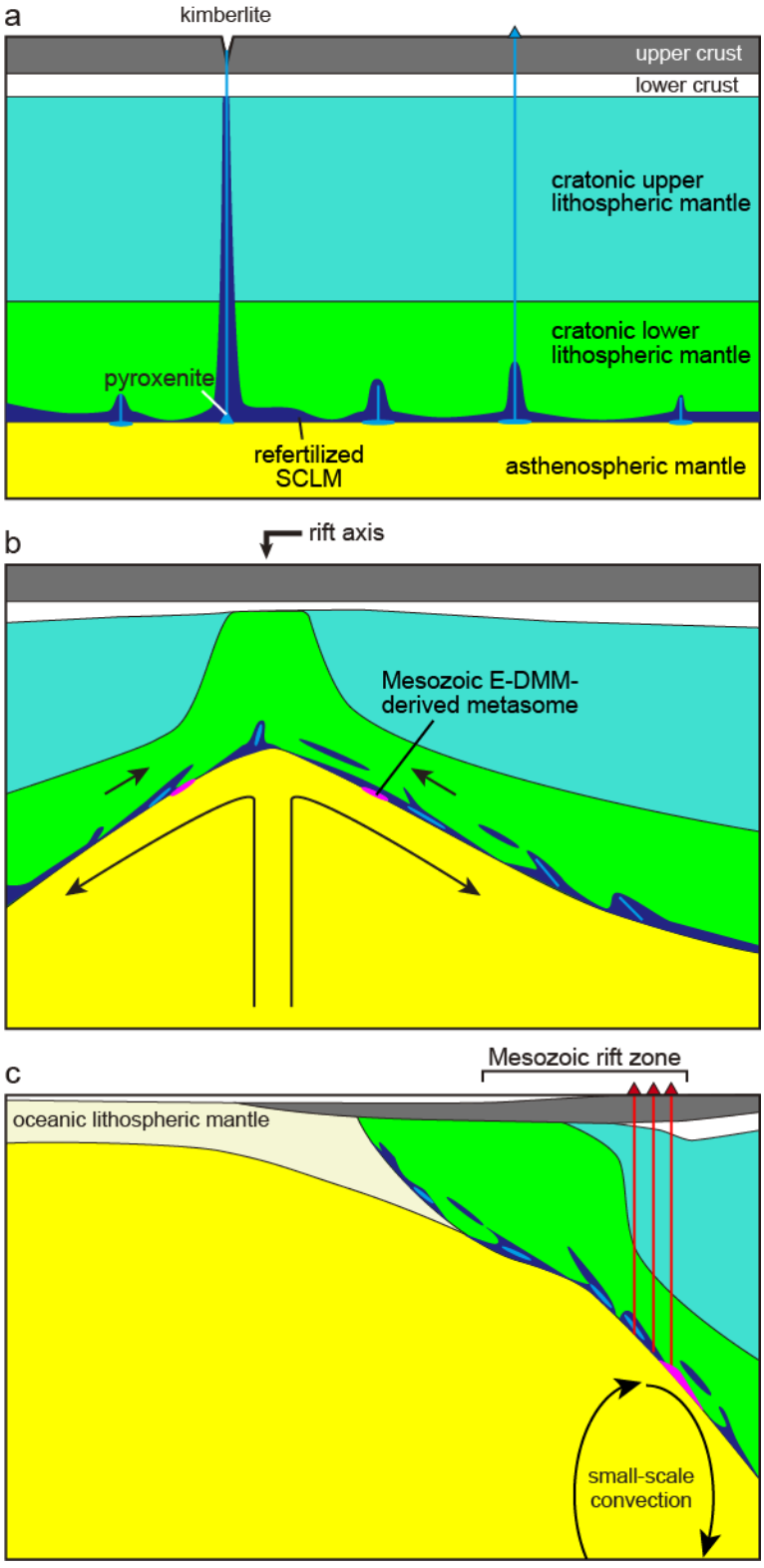

Figure caption: Schematic cross-sections illustrating the source materials and melting process of passive continental margin magmatism.

Reference:

- Authors: Iyasu G. Belay, Ryoji Tanaka, Hiroshi Kitagawa, Katsura Kobayashi & Eizo Nakamura.
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