

# **Delamination of lithospheric mantle in the central Sulu orogenic belt in early Cretaceous: evidence from trachyandesites and lamprophyres of new scientific drilling LK-1**

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The Lingshan Island Scientific Drilling (LK-1) uncovers an episode of Early Cretaceous rifting in the central Sulu orogenic belt (SOB), indicating that the SOB has entered into an extensional environment before 147Ma[1][2]. Several igneous rock layers with zircon U-Pb dating results of 130Ma from the core of LK-1, which could be compared to the volcanic rocks at ~120Ma on Lingshan Island. They are shoshonitic to high K calc-alkaline trachy-andesites to trachytes with a few intercalated lamprophyres and rhyolite. Except for the rhyolite, the high Mg#, high alkali contents, enriched LILE and depleted HFSE of these volcanic rocks indicate they are all lithospheric mantle derived melts. Sr-Nd-Pb isotopic features suggest that there were two magma origin: (1) EMI-type lithospheric mantle, (2) Old Yangtze lower crust. The earlier magma were all derived from the enriched lithospheric mantle, while the later one were the mixing products between the melts from those two origins. This suggests melts from crustal melting did not emplace upwards across the crust and erupt until ~120Ma. This may be caused by the different thickness of the lithosphere between 130Ma and 120Ma. The average (Tb/Yb)<sub>N</sub> ratios of the earlier magma (≈3.3) and later magma (≈2.1) suggest more residual garnet in the source of the earlier rocks and thus an increased thinning of the lithosphere during 130~120Ma[2]. In addition, (Tb/Yb)<sub>N</sub>, (La/Yb)<sub>N</sub> and Yb<sub>N</sub> change discontinuously and there are obvious gaps between these values of the different stages. This abrupt change shows that the lithospheric mantle was thinned very sudden and fast in 10Ma, indicating the lithospheric thinning event was probably mainly caused by the delamination rather than other mechanisms which were characterized by a gradual, long-time and continuous process.

[1] Cheng Y J, Wu Z P, Liu X Y, et al. (2021), Science China Earth Sciences, 64.

[2] Zhou T F, Zhou Y Q, Søager N, et al. (2022), Science China Earth Sciences, to be published.