

Stable Neodymium Isotopic Composition of Cenozoic Basalts From Eastern China

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The basaltic rocks in eastern China, primarily formed at the Mesozoic and Cenozoic eras, are crucial for understanding deep Earth processes. They provide critical insights into deep carbon cycling, revealing how subducted sediments and carbonates influence mantle composition through magnesium isotopic signatures. These basalts also serve as a window into mantle dynamics, reflecting interactions between subducted slabs and the mantle transition zone. Currently, extensive research has been conducted on the Fe, V, Cr, Mg, Cu, and Ni isotopes in the eastern China basalts. These studies indicate the presence of recycled carbonates and eclogites in the mantle source, highlighting the role of subduction in mantle heterogeneity.

Recent studies highlight the utility of stable neodymium isotopes (e.g., $\delta^{146/144}\text{Nd}$) in tracing the recycling of crustal materials in the subduction zones. For instance, slab-derived fluids and melts released from the subducting plate can impart distinct $\delta^{146/144}\text{Nd}$ signatures, which modify the isotopic composition of the overlying mantle wedge. This isotopic approach provides a novel tool to investigate crust-mantle interactions and slab-to-mantle material transfer, offering insights into the role of subduction-related metasomatism in mantle heterogeneity. Nd is an incompatible element, is preferentially enriched in the melt phase during magmatic partial melting and fractional crystallization processes. In this study, we explore the stable Nd isotopic composition ($\delta^{146/144}\text{Nd}$) of basalts from eastern China. The measured $\delta^{146/144}\text{Nd}$ values range from -0.05‰ to -0.023‰ , which are slightly lower than those of the bulk silicate Earth (BSE) ($\delta^{146/144}\text{Nd} = -0.022\text{‰}$). This deviation likely reflects the contribution of subducting materials, offering novel insights into the behavior of Nd isotopes in mantle-derived magmas and their potential as robust tracers for subduction processes.