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Geochemistry of Cenozoic basaltic rocks from Anhui province, China and their geological implication

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The purpose of this paper is to analyze the major and trace elements (including rare-earth elements) and Sr and Nd isotopic ratios and to date the basaltic rocks by Ar-Ar method in order to deduce the petrogenesis and magmatic evolution of these rocks and confer the process of differentiation controlled the variation of chemistry of these basaltic rocks as well as to identify the geochemical characteristics of the upper mantle beneath Anhui province. The geochemical characteristics observed in the studied basalts indicate that the mantle source in this region might have experienced metasomatic processes prior to partial melting, which could be linked to an ancient subduction process. Combining the geochemical characteristics in the studied basalts with previous research, we propose that the underlying mantle source in Anhui province may have undergone metasomatism due to the carbonatitic melts. These melts are believed to have originated from carbonated eclogite, derived from subducted Pacific slab materials present in the deeper mantle. According to the Sr-Nd isotope data, we propose that the Anhui basalts may have originated from the partial melting of a mantle source representing a mixing of two end-members: DMM (Depleted MORB Mantle) and EM-Ⅰ (Enriched Mantle 1). The Anhui basaltic magmas may have originated from the partial melting of EM-Ⅰ, potentially influenced by upwelling asthenospheric mantle or asthenospheric diapirism processes. The mantle source in the study area experiences partial melting at 1-5%, 15%, and 1-10%, resulting in the formation of parent magmas for alkali basalt, tholeiitic basalt, and Nushan alkali basalt. Subsequently, the parent magmas experienced fractional crystallization processes, which included minerals like olivine, pyroxene, and plagioclase. This led to the formation of various types of basalt in the study area.