

Generation of late Mesozoic granites in the paleo-oceanic arc unit of the Tongbai orogen, central China

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Granitoids are the essential constituent of Earth's continental crust, their progenesis has been frequently served as a vital window to probe the chemical evolution and lithological configuration of the deep crust. In this study, we undertake an integrated study of major mineral compositions, zircon and titanite U-Pb ages, zircon Hf-O isotopic compositions, titanite Nd isotopic compositions, as well as whole-rock geochemistry for the Liangwan granite pluton and mafic microgranular enclaves (MMEs) within it in a Paleozoic paleo-oceanic arc unit of the Tongbai orogen. Zircon and titanite U-Pb dating yielded identical ages of ca. 130 Ma for the Liangwan granites and MMEs, suggesting they were coevally formed. Petrographic observations and mineral compositions reveal that the MMEs probably represent magmatic globules commingled with their host magmas. The MMEs have relatively low silica but high $Mg^{\#}$ values, and are characterized by enrichment of large ion lithophile elements but depletion of high field strength elements. They exhibit enriched Sr-Nd-Hf and normal mantle-like zircon O isotopic compositions. These features suggested that they were sourced from an enriched mantle. The host granites have high SiO_2 and low $Mg^{\#}$ values. They show similar Sr-Nd-Hf-O isotopic signatures to the MMEs, indicating that their crustal precursors were likely cognate with the MMEs. The Liangwan pluton exhibit enriched isotopic compositions distinct from the ambient juvenile arc crust suggesting that the basement of the paleo-oceanic arc in the Tongbai orogen have been replaced before the late Mesozoic.