

# Extreme negative Eu anomalies in peraluminous granites reflect strongly reduced conditions?

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Mesozoic peraluminous granites (aluminum saturation index > 1.0) in South China, especially the Nanling granites, often exhibit extreme negative europium (Eu) anomalies ( $\text{Eu}/\text{Eu}^* < 0.1$ ) (Fig. 1), which are widely attributed to the fractionation of plagioclase. However, the extent of Eu depletion depends on two factors: (1) the ratio of  $\text{Eu}^{2+}/\text{Eu}^{3+}$  in the melt controlled by redox conditions, and (2) the degree of plagioclase crystallization/retention. Here, we calculate Eu anomalies in granitic magmas based on partial melting and fractional crystallization models. We find that even under conditions of extreme plagioclase retention/fractionation, to achieve Eu anomalies < 0.1 in granites requires oxygen fugacities of < FMQ-7 and FMQ-5 for partial melting and fractional crystallization scenarios, respectively. The occurrence of such low oxygen fugacities depends on the composition of the source materials and the physical and chemical conditions during granite formation. Although Mesozoic peraluminous granites were formed in three episodes in South China (Indosinian/Trassic, early Yanshanian/Jurassic, and late Yanshanian/Cretaceous), extreme negative Eu anomalies ( $\text{Eu}/\text{Eu}^* < 0.1$ ) were mostly observed in the early Yanshanian granites, particularly those formed from 165 to 140 Ma. For comparison, peraluminous granites with extreme negative Eu anomalies are also rare in the younger Himalaya orogen (Fig. 1). We suggest that the Yanshanian granites in South China may have undergone extensive assimilation of graphite in metamorphic strata during extensional environments after flat-slab subduction. These extensive graphite assimilation processes may have also primed the conditions of the granites for extensive Tin (Sn) mineralization in this region.

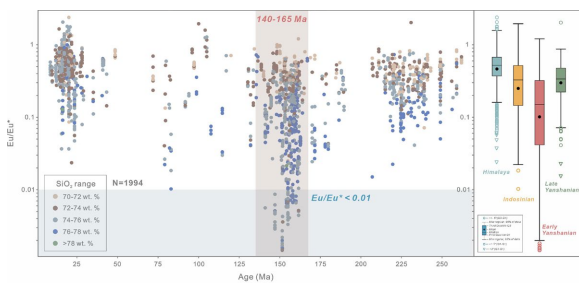


Fig 1. Eu anomalies of peraluminous granites formed in South China and the Himalaya.