Petrology and geochemistry of shoshonitic volcanic rocks from Luzong in the Lower Yangtze region, eastern China: Petrogenesis and inferences on the nature of the mantle sources

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The Mesozoic volcanic rocks from the Luzong basin in the Lower Yangtze region comprise a wide compositional range from trachybasalt through shoshonite to latite and trachyte. ^{40}Ar-^{39}Ar ages of the volcanic rocks range from 140 to 125 Ma. Geochemically, the volcanic rocks display high K_2O (3.93-7.45%) and high K_2O/Na_2O ratios (0.82-1.88) against a wide range of SiO_2 contents (53.52-67.78%). They also have high Al_2O_3 (16-19%), high K_2O+Na_2O values (>6%), and low TiO_2 contents (<1.3%), which are typical for the shoshonite associations. The volcanic rocks are enriched in LILE (e.g., Rb, Th, Pb) and LREE [$(La/Yb)_N$=13.79-19.12], depleted in HFSE (e.g., Nb, Ti), and have uniform initial $^{87}Sr/^{86}Sr$ ratios (0.7057-0.7065) but a relatively wide range of $\varepsilon_{Nd}(t)$ values (-5.01 ~ -9.96).

The Sr, Nd isotopic ratios of the volcanic rocks show no correlation with SiO_2 contents and Sr, Nd concentrations, and the less evolved samples are more enriched in LILE and LREE, implying that crustal contamination has not played an important role in the genesis of the magmas. Hence, the "crustal" geochemical signatures of the volcanic rocks were predominantly inherited from the source region. Both the enriched Sr-Nd isotopic compositions and LILE and LREE concentrations of the volcanic rocks argue strongly that they were derived from the partial melting of an enriched lithspheric mantle, which might have undergone metasomatism by fluids released during the subduction of the Paleao-Pacific plate beneath the Eurasian plate at Late Mesozoic.

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Adakitic signatures in Andean water-rich magmas at Nevado de Longaví

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Nevado de Longaví volcano (NLV - 36.2°S, Chilean Andes), which lies directly over the projection of the subducted Mocha Fracture Zone, is the only Quaternary center within the 33-41°S portion of the Southern Volcanic Zone (SVZ) that has erupted magmas with robust adakitic signatures. As the Nazca Plate which is being subducting beneath this part of the arc is Eocene in age, slab melting is not a viable mechanism for the adakite generation at NLV. These Holocene adakitic dacites (63-65 wt% SiO2) are the youngest and most evolved magmas at NLV, which has produced a range of intermediate magmas that have variable tendencies towards the adakitic end-member. NLV adakites have anomalously high modal hornblende (augite-free), suggesting 5-6 wt% H2O, and are exceptionally oxidized (NNO+1.7). They have high Sr and Sr/Y (65-75), coupled with high Ba/Th, Pb/τh, and high boron concentrations (35-45 ppm) for SVZ magmas of comparable SiO2. In contrast, the concentrations of Rb, Ba, K, Zr, Nb, Hf, U and Th in the adakites and are anomalously low compared to any other SVZ dacites. Plausible parental magmas (MgO <6 wt%) for NLV adakites have lesser degrees of the same signature. The major and trace element differentiation trend from hydrous parent magmas to adakites is well modeled by deep crustal fractionation, without significant crustal assimilation, of a hornblende-rich assemblage. Depletions of Y and HREE relative to parent magmas require minor early garnet fractionation, which is supported by experimental results on a number of water-rich mafic to intermediate compositions. We attribute the ultimate origin of these NLV magmas to high fractions of partial melting related to extreme local fluid-fluxing from the oceanic Mocha Fracture Zone.