

## **Geochronology, geochemistry and tectonic significance of three-phase Jurassic–Cretaceous volcanic rocks in the east of southeast China**

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Three volcanic rock layers are distributed within the Jurassic–Cretaceous strata in the junction region of Zhejiang, Jiangxi, and Anhui Provinces in the east of Southeast China. This study obtains the LA–ICP–MS U–Pb zircon (Th/U ratios > 0.15) with ages  $154.7 \pm 2.5$  Ma and 139–134 Ma for rhyolites from the lower-layer (plus ignimbrite) and middle-layer rhyolites, respectively. Moreover, the SHRIMP zircon U–Th–Pb analytical results show that a weighted  $^{206}\text{Pb}/^{238}\text{U}$  average of  $99.0 \pm 0.7$  Ma for the upper basalt layer.

The lower rhyolite layer has relatively low SiO<sub>2</sub> and high Al<sub>2</sub>O<sub>3</sub> contents, and shows an enrichment of large ion lithophile elements and depletion of high field strength elements. This layer is strongly enriched in LREE and depleted in HREEs, with weakly negative Eu anomalies. By contrast, the middle rhyolite layer is characterized by high SiO<sub>2</sub> and low Al<sub>2</sub>O<sub>3</sub> contents. This layer has typical wing-shaped rare earth element distribution patterns with negative Eu anomalies. The late period basalt, which is plotted within the alkaline series field in the SiO<sub>2</sub>–(K<sub>2</sub>O+Na<sub>2</sub>O) and Nb/Y–Zr/TiO<sub>2</sub> diagrams, displays the characteristics of the alkaline series. The values are provided in the tholeiitic basaltic rock field in the TFeO/MgO–SiO<sub>2</sub> diagram. Therefore, the basalt belongs to the typical alkaline olivine basalt. Alkali olivine basalt with low Nb/Th and Ti/Yb values (i.e., Nb/Th = 2.21–4.98 (3.43 on average); Ti/Yb = 3125–5753 (3975 on average)) and high Nb/U value (i.e., Nb/U = 6.63–25.82 (16–24 on average)) indicates that alkaline olivine basalt contributes to the crustal material.

The lower layer rhyolite behaves similar to the S-/A-type rocks and the upper layer has affinity to A-type rocks, thereby implying an extension environment. Overall, igneous rocks evolved from high Sr–low Yb to low Sr–high Yb, which may reflect the evolution of the tectonic setting from the subduction to the lithospheric extension setting during the early Cretaceous (ca.  $142 \pm 3$  Ma). After a relatively quiet period, the lithospheric extension acts intensely and causes the effusing of basaltic lava at approximately 99 Ma during the middle Cretaceous.

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