Early Paleozoic subduction in Cathaysia: evidence from tectonic mé lange in the northwest Yunkai Domain

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Abstract

The early Palaeozoic tectonic history of the South China has been extensively debated in the last two decades, two contrasting groups of models have been proposed, i.e. subduction collisional belt vs. intracontinental orogen. The Yunkai Domain is one of the most important pre-Devonian metamorphic basement, which is located in the west Cathaysia Block. In this study we report an early Paleozoic subduction-collision related tectonic mélange in the northwest Yunkai Domain, South China. The mé lange is consisted of volcanic rocks, ophiolite fragments and forearc accretion sedimentary complex, with strong deformation of lineation, foliation, fold and thrust fault. We present the detailed LA-ICP-MS zircon U-Pb dating, major and trace element geochemical and Lu-Hf isotopic data for the volcanic rocks and ophiolite fragments. Zircon U-Pb dating shows that the volcanic rocks were erupted at 460 –443 Ma and the intrusion age is 430 Ma. The ophiolite fragments yield the formation age of 455 –437 Ma. The volcanic rocks are composed of high magnesian-magnesian basaltic andesite, allgovite, andesite and dacite rocks, show the affinities of arc related rocks (mostly like sanukite), with LREE, LILE (Rb, Ba, Th and U) enrichment and HFSE (Nb, Ta and Ti) depletion. The ophiolite fragments (basalt, diabase and amphibolite) are similar to those of mafic rocks from supra –subduction zone (SSZ), with LILE (Rb, Ba, Th and U) enrichment HFSE (Nb, Ta, Zr, Hf and Ti) depletion. The volcanic rocks and the ophiolite fragments are similar to those from forearc or arc setting. Zircon Lu-Hf isotopes of the volcanic rocks give negative initial ε Hf(t) values between -4.7 and -0.5. Zircon Lu-Hf isotopes of mafic rocks in the ophiolite give scattered negative initial ε Hf(t) values between -11.0 and +2.3. The ε Hf(t) values of the volcanic rocks and the ophiolite fragments indicate different degrees addition of crustal material into the mantal source. The volcanic rocks and ophiolite fragements of the mélange indicate an ealy Palaeozoic subduction progress was happened in this area. Briefly, our research on the mélange, in combination with early Paleozoic metamorphic features and the widely distributed early Palaeozoic igneous activities, reveal that the tectonic history have experienced subduction accretion orogenic process in the early Palaeozoic, Yunkai Domain, South China.

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Keywords: Yunkai Domain, Yunkai tectonic mélange, volcanic rocks, High-magnesia andesite, ophiolite fragments

