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# КРУПНЫЕ ИЗВЕРЖЕННЫЕ ПРОВИНЦИИ В ИСТОРИИ ЗЕМЛИ: МАНТИЙНЫЕ ПЛЮМЫ, СУПЕРКОНТИНЕНТЫ, КЛИМАТИЧЕСКИЕ ИЗМЕНЕНИЯ, МЕТАЛЛОГЕНИЯ, ФОРМИРОВАНИЕ НЕФТИ И ГАЗА, ПЛАНЕТЫ ЗЕМНОЙ ГРУППЫ (КИП – 2019)

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# PETROGENESIS OF PALEO-MESOPROTEROZOIC MAFIC ROCKS IN THE SOUTHWESTERN YANGTZE BLOCK OF SOUTH CHINA: IMPLICATIONS FOR TECTONIC EVOLUTION AND PALEOGEOGRAPHIC RECONSTRUCTION

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The Archean and Paleoproterozoic rock units in the Yangtze Block are tentatively incorporated within Nuna Supercontinent (Yin et al., 2013) (Furlanetto et al., 2016) (Wang et al., 2016) (Cawood et al., 2018), while the absence of precise paleomagnetic data has resulted in a number of contrasting and in some cases mutually exclusive models (Zhou et al., 2014) (Wang et al., 2014). During supercontinent breakup, extensive mafic magmatism can occur within and between previously connected crustal blocks (Ernst et al., 2008). These mafic magmatism can thus provide invaluable information on supercontinent reconstruction through the technique of magmatic barcodes comparison between different crustal blocks (Ernst et al., 2016).

In this study, three episodes of mafic magmatism are identified by zircon and baddeleyite U-Pb dating at 2299 ± 17 Ma, 1703 ± 8 Ma and 1511 ± 14 Ma in the southwestern Yangtze Block. These mafic rocks have tholeiitic compositions with enrichment of LILE but an absence of Nb, Ta, Zr, Hf anomalies, features similar to E-MORB. They have La/Ta (<22) and La/Nb (<1.5) ratios similar to asthenosphere- derived mafic melts. The ca. 2.3 Ga, ca.1.7 Ga and ca. 1.5 Ga mafic rocks have $\varepsilon_{Nd}(t)$ values of +0.2 to +4.3, −2.8 to +2.8 and +0.7 to +5.8, respectively. Furthermore, the ca. 2.3 Ga and ca. 1.7 Ga mafic rocks have $\varepsilon_{Hf}(t)$ values varying from −3.6 to +0.8 and +0.1 to +9.2. All these geochemical and isotopic data indicate that the studied mafic rocks may be dominantly sourced from asthenospheric mantle.

Thermodynamic modeling indicates that the mantle potential temperatures for the studied ca. 2.3 Ga and ca. 1.7 Ga dolerites are 1447 °C−1568 °C, 1511 °C −1529 °C, suggesting relatively hot mantle below the southwestern Yangtze Block at ca. 2.3 Ga and ca. 1.7 Ga. REE modeling indicates the ca. 2.3 Ga and ca. 1.5 Ga dolerites were generated by low degree melting (3–15%) of mantle source, while the ca. 1.7 Ga gabbros were derived from variable degree melting (5–20%) of mantle source. Fractionation of olivine, pyroxene and plagioclase contributes to changing the chemical compositions of the primary magma, while crustal contamination was relatively insignificant. These three episodes of mafic magmatism were generated in extensional setting. The ca. 2.3 Ga dolerite represents the oldest mafic magmatism identified in the southwestern Yangtze Block by far, documenting the dispersion of the Yangtze Block from the Nunavutia supercraton. Comparing the younger magmatic barcode records for various crustal blocks shows that the mafic magmatism at ca. 1.75–1.65 Ga in the Yangtze Block, has matches in northwestern Laurentia and southern Siberia. This period of extensive magmatism was presumably linked to the early attempted breakup of the Nuna supercontinent, indicating tight linkage among these continents in that supercontinent.

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