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U-Pb geochronology and geochemistry of volcanic rocks in the Manzhouli-Erguna, northeastern China and tectonic implications

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Located between the Siberian and the North China cratons, northeastern China was mainly controlled by two tectonic systems during Mesozoic time, i.e. the circum-Pacific system to the east and the Mongol-Okhotsk system to the northwest. As one of the largest terranes in northeastern China, the Great Xing'an Range (GXR) is characterized by widespread alkali-rich volcanic rocks that were predominantly formed from Middle Jurassic to Early Cretaceous (ca. 165 – 120 Ma). The tectonic nature of this large-scale volcanism remains controversial, with one model attributing it to the evolution of the circum-Pacific system, whereas another relates it to the Mongol-Okhotsk system. To test these models, we carried out U-Pb dating and geochemical analysis on volcanic rocks in the Manzhouli-Erguna area, along the northwestern margin of the GXR, ca. 450 km from the Mongol-Okhotsk suture belt. Major element analysis shows that these volcanic rocks (mainly trachytes and trachyandesites) belong to shoshonitic or high-K calc-alkaline series, with a wide range of SiO₂ content (47.7 -73.8 wt %). U-Pb zircon dating on five samples reveals three age groups (161 Ma, 146 – 149 Ma, and 123 – 125 Ma), which are representative of volcanic rocks in the GXR. Together with these new U-Pb ages, a compilation of precise ages of volcanic rocks in Manzhouli-Erguna indicates an eastward-younging trend for volcanic rocks younger than Middle Jurassic (ca. 165 Ma). We suggest a link between the eastward-migrating volcanic activities in Manzhouli-Erguna with the gradual, west-to-east closure of the Mongol-Okhotsk Ocean in the Late Mesozoic. Petrogenesis of the Manzhouli-Erguna volcanic rocks and their tectonic implications on the GXR volcanism will be further explored when results of trace element and zircon Hf isotopic analyses are available.

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