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Jurassic Subduction of the Paleo-Pacific Ocean in NE China: Zircon U–Pb and Sr-Nd-Hf isotopic Evidence from the Huashan and Taili Monzogranites

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Abstract: New whole-rock geochemical, Sr–Nd isotopic, and zircon U–Pb and Hf isotopic data are reported for Jurassic granites of the Xingcheng area of the northeastern North China Craton (Fig. 1), and the data used constrain the petrogenesis and tectonism of the region. U–Pb zircon data indicate that the Huashan and Taili monzogranites were emplaced during the Early (189 ± 2 Ma) and Late (155 ± 1 Ma) Jurassic, respectively. They have high SiO_2 and Al_2O_3 contents, and low MgO contents, typical of high-K calc-alkaline series rocks. They are I-type granites, enriched in light rare earth elements (REE) and large-ion lithophile elements, and depleted in heavy REE and high-field-strength elements, with negative P, Ti, and Eu anomalies. The Early Jurassic monzogranites have high Sr contents (338–347 ppm) and Sr/Y ratios (28.7–29.0), with low Y contents (11.8 –12.0 ppm), whereas the Late Jurassic monzogranites have Sr and Y contents of 221–306 ppm and 7.83–14.7 ppm, respectively, and Sr/Y ratios of 31.8–37.5. Both have adakitic characteristics (Fig. 2). The Early Jurassic monzogranite samples have a uniform $(^{87}Sr/^{86}Sr)_i$ ratio of 0.7046, $\varepsilon_{Nd}(t)$ values of –11.62 to –11.51, and $\varepsilon_{Hf}(t)$ values of –13.6 to –6.4, whereas the Late Jurassic monzogranites have higher $(^{87}Sr/^{86}Sr)_i$ ratios of 0.7069–0.7071 and lower $\varepsilon_{Nd}(t)$ (–20.65 to –20.46) and $\varepsilon_{Hf}(t)$ (–27.6 to –20.0) values. We suggest that the Early Jurassic adakitic rocks were derived from partial melting of thickened lower crust contaminated with mantle-derived materials, related to westward subduction of the Paleo-Pacific Plate. The Late Jurassic adakitic rocks were derived directly from partial melting of thickened lower crust in an extensional tectonic setting associated with an active continental margin.

Key words: monzogranite, Jurassic, adakite, petrogenesis, North China Craton

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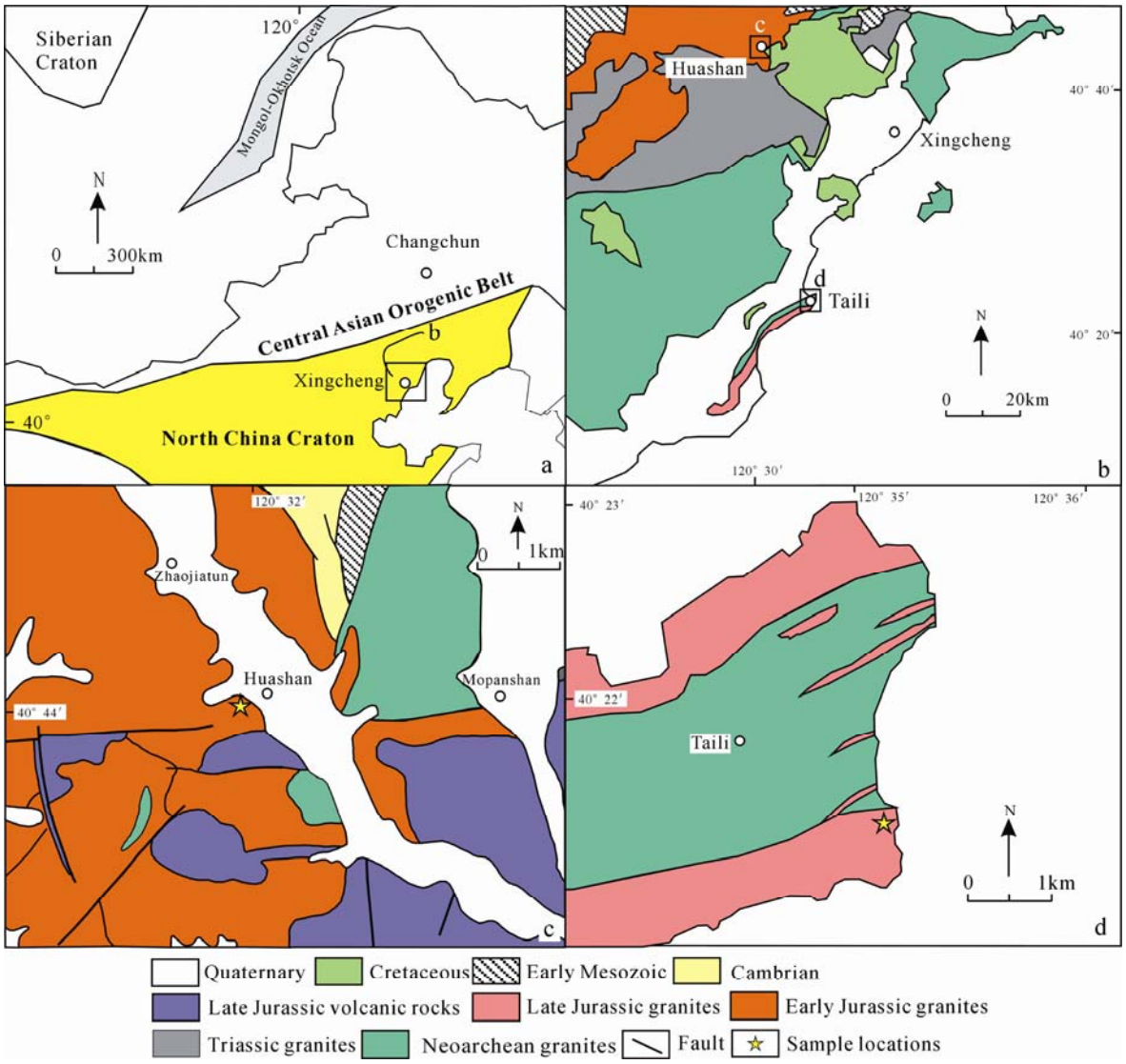

Fig. 1. Geological sketch map of the study area and sample collection location.

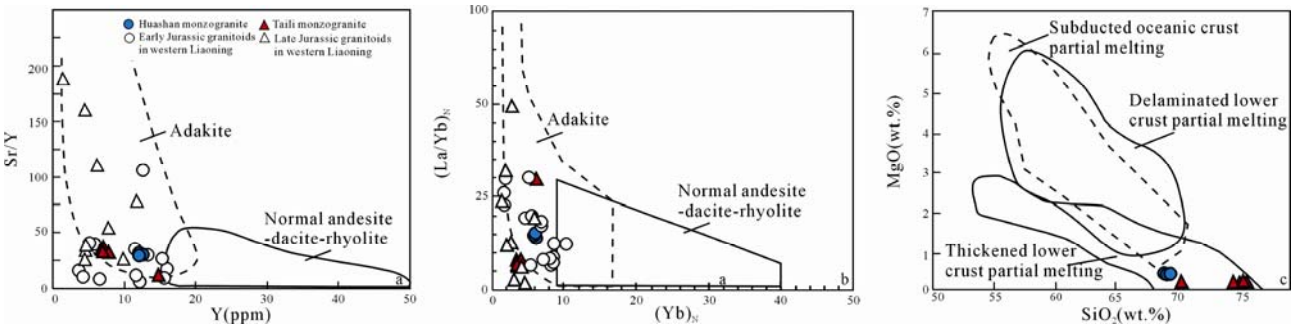

Fig. 2. Discrimination diagrams for adakite (a, b, after Defant & Drummond, 1990) and MgO vs SiO_2 (c, after Sheppard et al., 2001).