



## **Geochronology and geochemistry of the mafic dykes in the Helanshan complex: implications for the Mesozoic tectonics in the north China Craton**

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The Helanshan tectonic belt (HTB) is a major tectonic divide between the Alxa and Ordos blocks in the North China Craton. The geochronology and petrogenesis of the mafic dykes in the northern HTB are keys to understanding the tectonic evolution of this belt. The mafic dykes intruded into the Neoproterozoic metamorphic basement, and are mainly composed of diabase with a mineral assemblage of plagioclase (45%-60%), pyroxene (25%-35%), minor quartz and Fe-Ti oxides. The LAICPMS U-Pb analysis of zircon grains from representative dykes yield a weighted mean age of  $206 \pm 1.9$  Ma, which represents the crystallization age of the dyke. The diabases show high contents of  $\text{Fe}_2\text{O}_3$  T (11.88-17.55 wt.%), low contents of  $\text{SiO}_2$  (45.65-50.95 wt.%) and MgO (3.31-5.50 wt.%) with low Mg# of 33-44. They are characterized by enrichment of light rare earth elements (LREEs) and large ion lithophile elements (LILEs) and slight depletion of high field strength elements (HFSEs). These features suggest that the magma has undergone extensive fractionation of olivine and pyroxene but only minor crustal contamination during its evolution. Their high Sm content and La/Sm ratios, and low Sm/Yb ratio indicate that magma from which the dykes formed was derived from low degree (about 5%) partial melting of an enriched garnet-spinel lherzolite mantle source. Together with regional geology, these geochemical and geochronological data suggest that the mafic dykes in the HTB were formed in an intracontinental extensional setting during the late Triassic.