

A ~2.7 Ga Large Igneous Province (LIP) event in the Eastern Block of the North China Craton?

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The Neoproterozoic events in the Eastern Block can be divided into the ~2.7 Ga event that formed the 2.75-2.65 Ga rock associations in local areas, and the ~2.5 Ga event that formed the 2.55-2.50 Ga rock associations over the whole Eastern Block. Although the 2.75-2.65 Ga rock associations are only exposed in the Luxi and Qixia areas, the ~2.7 Ga event must have occurred across the whole Eastern Block and was a major crustal accretionary or mantle-extraction event that formed a thick mafic crust beneath the whole Eastern Block based on the following lines of evidence:

(1) The 2.75-2.65 Ga rocks in the Luxi granite-greenstone terrane have positive $\epsilon\text{Hf}(t)$ values (+2.7 to +10.0), with most zircon Hf model ages close to the rock-forming ages (Jiang et al., 2010; Wan et al., 2011), which provides robust evidence that the ~2.7 Ga event that formed the 2.75-2.65 Ga rock associations was a crustal accretion (mantle extraction) event, not a crust-reworking event.

(2) The 2.55-2.50 Ga rock associations in the Eastern Block possess mildly positive to slightly negative $\epsilon\text{Hf}(t)$ values, with most zircon Hf model ages pointing to 2.8-2.6 Ga (Geng et al., 2012), similar to rock-forming ages of the 2.75-2.65 Ga rock associations in the Luxi granite-greenstone terrane, suggesting that the 2.55-2.50 Ga rocks in the Eastern Block were mainly derived from the partial melting of an early Neoproterozoic (2.75-2.65 Ga) juvenile crust that formed at ~2.7 Ga. As the 2.55-2.50 Ga rocks are ubiquitous over the whole Eastern Block, the 2.7 Ga event must have occurred over the whole Eastern Block, forming an early Neoproterozoic juvenile crust that experienced partial melting or reworking to form the 2.55-2.50 Ga rock associations.

(3) As most of the 2.55-2.50 Ga rock associations in the Eastern Block are TTG rocks, which are generally derived from the partial melting of a thickened mafic crust (eclogite or rutile/garnet-bearing amphibolite). This means that an early Neoproterozoic (2.75-2.65 Ga) juvenile crust formed by the ~2.7 Ga event should be a mafic-dominant crust, which is either a lower continental crust or an oceanic crust. In this case, the ~2.7 Ga event in the Eastern Block may have represented a Large Igneous Province event that formed the main body of the Eastern Block. This work was financially supported by Hong Kong RGC GRF (17301915 and 17306217).