Paper Number: 2828

First direct evidence of Pan-African orogeny associated with Gondwana assembly in the Cathaysia Block of southern China

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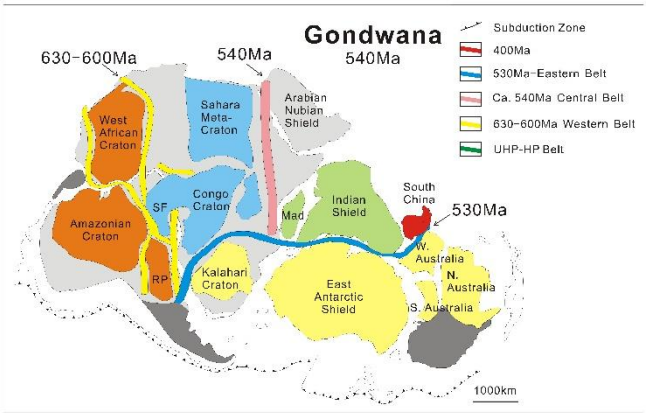
U–Pb zircon age along with geochemical and Nd–Hf isotopic results are reported for the amphibolites occur in the Neoproterozoic Mamianshan Group in the central part of Cathaysia Block, China. The amphibolites are characterized by low SiO2 (43.8-44 wt.%) and high MgO (9.99-10.5 wt.%). They also have high compatible element contents (Cr 381–430 ppm, Co 54–56 ppm and Ni 175–197 ppm) and high TiO2 (3.05-3.39 wt.%). They display OIB-like incompatible elemental patterns, similar to many tholeiitic basalts in continental rifts. These geochemical characteristics indicate that the primary magma of these basalts was probably derived from a depleted asthenospheric mantle source.

LA-ICP-MS analysis indicates that all the zircons extracted from amphibolites have high Th/U ratios and yield U-Pb zircon ages of 533±7 Ma. Lu-Hf isotopic analysis on these zircons gives Hf model ages ranging from 900 to 1200 Ma. Cathodo-luminescence images of the zircons show unzoned or sector-zoned structure. We interpret that these U-Pb ages should be regarded as the metamorphic age of the amphibolites. This Late Neoproterozoic–Cambrian (Pan-African) tectonothermal event in the Cathyasia Block provides first robust evidence on the relationship of the South China Block (SCB) was an integral part of the Gondwana assembly.



Combined with the results from paleomagnetic data [1], faunal affinities [2], comparative stratigraphic records [3] and comparative detrital zircon age patterns [4], the SCB was likely located between north India and west Australia along the northern margin of East Gondwana with the Cathaysia Block facing the western Australia.

Figure 1: Location of the SCB in Gondwana supercontinent (Modified after Santosh et al. [5])

References:

[1] Yang Z.Y. et al. (2004) Earth and Planetary Science Letters 220: 423-434.
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[4] Cawood P.A. et al. (2013) Geology 41:903-906.
[5] Santosh, M. et al. (2014) Gondwana Research 25:945-965.