

## New geochronological data from Mongolia: Implications for pre-Jurassic tectonic evolution of the CAOB

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**INTRODUCTION** The Central Asian Orogenic Belt (CAOB) is an east-trending collision belt between the Angara Craton and North China-Tarim blocks. The complex geology of the belt has prevented us from fully understanding its tectonic history. This study reports 1) age distribution of detrital zircons from some sandstone (ss.) samples in Mongolia, and 2) age-constraints of several shear zones.

**GEOLOGY** The northernmost Mongolia consists of continental elements of 0.7-3.1 Ga, and Neoproterozoic-Cambrian island-arc elements on the south. Further on the south are the following geologic elements. North-central Mongolia is occupied by Ordovician shallow marine beds (Haraa Belt) and Carboniferous accretionary complex (AC; Khangai-Khentei Belt) with a top-to-NNW Shear Zone alpha in between. In the Mongol Altai Mountains, NW-trending sinistral Shear Zone beta divides Ordovician shallow marine beds (Turgen Terrane) and Devonian island-arc elements (Tseel Terrane) on the north and an AC (Bidz Terrane) on the south. The South Gobi region on the east of Noyon is occupied mainly by Ordovician-Carboniferous arc volcanics, with some limestone bodies around Mandal Owoo. Narrow zones of AC are detected near Shine Jinst and to the south of Janjin.

**DETRITAL ZIRCONS** The age-distribution of zircons from 12 ss. samples can be divided into three types from the shape of the probability density plot (peak ages; main peaks are in bold letters) and percentage of Precambrian zircons (%Pc) listed below.

**Type A:** Multimodal (**470-570 Ma**, **750-1000 Ma**, 1.7-2.0 Ga, **2.4-2.6 Ga**), %Pc > 70. Ordovician ss. in the Haraa Belt belongs to this type.

**Type B:** Multimodal (maximum peak at **420-600 Ma**, 700-800 Ma, **0.9-1.05 Ga**, 1.25-1.5 Ga, 1.8 Ga, 2.5 Ga), with %Pc of around 35. Ordovician-Silurian shallow-marine beds in the Turgen Terrane, AC-forming ss. to the south of Janjin, and volcanic ss. near Mandal Owoo belong to this type.

**Type C:** Unimodal to quasi-unimodal (**300-450 Ma**, 800-1000 Ma), with %Pc between 0 and 20. The AC of the Khangai-Khentei Belt, and Devonian-Carboniferous AC and island-arc elements in the SW to S Mongolia belongs to this type.

**AGE OF SHEAR ZONES** From U-Pb dating results of sheared and post-tectonic igneous rocks, shear zones alpha and beta were dated to around 270 Ma and 280 Ma, respectively.

### DISCUSSION

**(1) Provenance of types A and B ss.** The 750-1000 Ma igneous activity detected in both types has not been known from the North China Block and Angara Craton, but has been reported from ancient north Gondwana, such as India and Australia (e.g. Squire et al., 2006). Main age peaks from Cambrian ss. of India coincide with those from type A ss.. Peaks of 1.05-0.9 Ga and 0.82-0.74 Ga are likely the age of assembly (Tarim orogeny of Lu et al., 2008) and dispersion (Zhang et al., 2009a, b) of Rodinia, respectively. The 1.05-0.9 Ga age peak detected from type B ss. coincides with the age of the Tarim orogeny. Further, 1.25-1.5 Ga age peak only from type B ss. has also been known from Tarim ss., but has never reported from India and Australia (Rojas-Agramonte et al., 2011). Hence the provenance of type A and type B ss. was likely northern Gondwana (present-day India) and northwestern Gondwana (present-day Tarim), respectively.

**(2) Tectonic setting of type C ss.** Type C ss. shows unimodal age distribution with low %Pc values. It was likely deposited in an island-arc setting apart from a continental block with Precambrian basement rocks.

### (3) Tectonic history

1) In Ordovician-Silurian times, type A and B ss. was deposited in continental arcs along northern and northwestern Gondwana, respectively. 2) The arcs were rifted from Gondwana and shifted northward. 3) In Devonian-Carboniferous times, type C ss. was deposited in an arc-trench setting apart from a continental block. 4) In Permian time (ca. 280 Ma), geologic elements of 2) and 3) were amalgamated, forming shear zones alpha and beta, and the main framework of the CAOB in Mongolia was constructed.

Keywords: U-Pb age, zircon, LA-ICP-MS, Mongolia, Central Asian Orogenic Belt, Gondwana

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