



## **U-Pb zircon ages and Nd isotopes of Palaeozoic volcanic arc systems in southern Mongolia: constraints on crustal growth in the Central Asian Orogenic Belt**

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Southern Mongolia is located in the heartland of the Central Asian Orogenic belt (CAOB) and records a significant part of the development of this accretionary orogen. We present whole-rock Nd-isotopic data and U-Pb zircon ages on metavolcanic and metaigneous rocks to date the time of emplacement and infer geodynamic environments during evolution of the CAOB.

We investigated seven mountain ranges typifying four major lithotectonic units. In the Ikh Bogd and Gobi-Altay units, felsic explosive volcanism as well as a subduction-related magmatism occurred from late Cambrian to early Ordovician times. Felsic volcanisms occurred in the Gobi Altay and Zoolen composite units (forearc/backarc systems) from late Silurian to late Devonian time. Detrital zircons from early Ordovician-early Devonian arc-derived clastic sediments document continental input as old as late Archaean. Metavolcanic-sedimentary sequences contain calc-alkaline and tholeiitic back-arc related basalts as well as felsic igneous rocks with strong subduction-related characteristics. Basaltic samples display positive initial  $\epsilon\text{Nd}$  of 6.6 to 9.0 and young mean crustal residence age of ca. 0.5 Ga, indicative of depleted mantle sources. Nd isotopic compositions for felsic samples appear more heterogeneous with intermediate to low  $\epsilon\text{Nd}$  from +4.5 to -1.9 and relatively old  $T_{DM}$  of 0.7 to 1.3 Ga. These features reveal composite sources characterized by a juvenile component as well as relatively old crustal material, suggesting evolution in a transitional island arc/backarc complex, probably built on an older magmatic margin. Large volumes of felsic calc-alkaline

volcanic and pyroclastic rocks were emplaced in the southeastern part of the Tseel unit in middle Devonian. The Nd isotopic systematic indicates considerable involvement of old crustal material during the generation of these subduction-related rocks. A late volcanic event is recorded in the Ih Bogd and Tseel units by the emplacement of undeformed volcanic sequences of early Permian age. Ti-rich basalts as well as HFSE-enriched peralkaline felsic volcanic rocks display well developed within-plate characteristics, corroborated by Nd isotopic systematics (low  $\epsilon\text{Nd}$  of -2.0 to +1.0,  $T_{DM}$  of 0.82 to 0.90 Ga).

Our Nd-isotopic data and zircon ages indicate a significant involvement of relatively old crustal material in the generation of Palaeozoic island arc-backarc systems. We suggest that the CAOB in southern Mongolia contains slivers of old microcontinental blocks, interspersed within accreted juvenile volcanic arcs and backarc segments. Our results also argue for continuous accretion during the formation of the CAOB from the early Neoproterozoic to the late Palaeozoic and suggest a similar geodynamic evolution as found along the present western Pacific margin.