Geophysical Research Abstracts
Vol. 16, EGU2014-6108, 2014
EGU General Assembly 2014

The age, nature and likely genesis of the Cambrian Khantaishir arc, Lake Zone, Mongolia

Vojtěch Janoušek (1,2), Yingde Jiang (2,3), Karel Schulmann (1), David Buriánek (1), Pavel Hanžl (1), Ondrej Lexa (2,1), Turbat Ganchuluun (4), and Altanbaatar Battushig (5)

(1) Czech Geological Survey, Prague, Czech Republic (vojtech.janousek@geology.cz), (2) Institute of Petrology and Structural Geology, Charles University in Prague, Czech Republic, (3) Department of Earth Sciences, The University of Hongkong, China, (4) School of Geology and Petroleum Engineering, MUST, Ulaanbaatar, Mongolia, (5) Institute of Geology and Mineral Resources of Mongolian Academy of Sciences, Ulaanbaatar, Mongolia

Recent discovery of the huge Cambrian arc in the Khantaishir Mountain Range (SE Mongolian Altai) suggests that the principal Neoproterozoic and Devonian–Carboniferous episodes of crustal growth in the Central Asian Orogenic Belt (CAOB) (Sengör et al. 1993) have to be revised. This probably the largest arc system known in the Mongolian tract of the CAOB is seemingly intrusive into the Neoproterozoic accretionary wedge (the Lake Zone) in the N and underthrust southwards below the Palaeozoic volcanosedimentary prism (Gobi Altai Zone). The arc shows a section from deep, ultramafic cumulates to shallower crustal levels of the magmatic system and thus provides an excellent opportunity to study this important period of crustal growth in the Mongolian CAOB.

The magmatic rocks are intermediate to ultrabasic (SiO_2 = 39.2–61.8 wt. %), rather primitive (mg# = 45–60) Amp–Bt tonalites to coarse-grained Amp gabbros and hornblendites. They are Na-rich (Na_2O/K_2O = 1.3–9.7 by wt.), exclusively metaluminous and mostly subalkaline, except for the ultrabasic types that enter the alkaline domain due to accumulation of Amp crystals. The P–T conditions calculated using the Amp thermobarometer of Ridolfi et al. (2010) show that the gabbro crystallized at 930–950 ˚C and 0.36–0.43 GPa. The (normal-) calc-alkaline chemistry and characteristic trace-element enrichment in hydrous-fluid mobile large-ion lithophile elements (LILE: Rb, Ba, Th, U, K and Pb) over high-field strength elements (HFSE: Nb and Ta) confirm an origin within an igneous arc.

The newly obtained LA ICP-MS zircon ages for three tonalites–diorites range between 516 $\pm$ 2 Ma and 494 $\pm$ 3 Ma. While zircons in two of them give high initial ε_{Hf} values (+8 to +14), implying a derivation by (near) closed-system fractionation from little modified, depleted-mantle derived magmas, the third contains significantly different component (ε_{Hf} = +3 to +6). The latter component may have come from a distinct, less depleted/metasomatized mantle domain or, more likely, originated by remelting of a juvenile metabasic crust, presumably by the advected heat from the voluminous mantle-derived melts. The single gabbro yielded two zircon populations, 521 $\pm$ 6 Ma (avg. ^{238}U–^{206}Pb age, 3 grains) and 538 $\pm$ 3 Ma (8 grains). The zircons contain both components distinguished in the more felsic samples (ε_{Hf} = +4 to +13), compatible with the field evidence for the presence of several generations of the basic magmas, as well as magma mixing/mingling between contrasting magma batches.

Taken together, our data provide an evidence for a Cambrian (c.520–495 Ma) magmatic-arc activity in the Khantaishir Range. The lack of significant zircon inheritance and rather primitive ε_{Hf}values (all $>$ +3) imply that the arc was not funded on mature continental crust. On the contrary, a key role was played by depleted-mantle derived magmas, perhaps with some recycling of a juvenile metabasic crust.

Financial support: Grant Agency of the CR (P210/12/2205), Ministry of Education of the CR (LK11202) and Hong Kong Research Council (HKU705311P and HKU704712P).

Ridolfi *et al.* 2010. *Contrib. Mineral. Petrol.* **160,** 45–66.

Sengör *et al.* 1993. *Nature* **364,** 299–307.