

Tectonic evolution of southern and central Mongolia

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The crustal growth and continent construction processes are responsible for episodic formation of Central Asian Orogenic Belt crust. The net crustal growth is a magmatic process responsible for formation of juvenile crustal material while the continental construction is a process of mechanical addition of crustal fragments to continent.

In Mongolia, well-defined Cambrian suture rims the western borders of Proterozoic continental fragments in Mongolia and Russia (1200 to 700 Ma). This arcuate suture zone called **the Lake Zone** is defined by numerous ophiolites (800–560 Ma) composed of magmatic arcs and eclogite–blueschist-bearing mélanges dated at 540–520 Ma. The suture zone originated by Early Cambrian obduction of young (Late Proterozoic) oceanic basins and magmatic arcs (the first Paleo Asian Ocean PAO I). The tectonic zone further south called the **Mongol Altai zone** and is built by gneisses and metasediments dated at 530–470 Ma interpreted as a Cambro Ordovician accretionary prism covered by Siluro–Devonian shallow water and carbonate rich passive margin sequences of the PAO II ocean. This unit is intruded by Devonian–Carboniferous granitoids derived from juvenile material and interpreted as a Japan type magmatic arcs in Mongolia. The region of southern and south-western Mongolia assigned to PAO II (**the Trans Altai Zone**) is composed of basaltic crust, mantle fragments covered by Silurian cherts, early Devonian basaltic-andesitic volcanics and late Devonian volcanoclastic sediments interpreted in terms of intraoceanic arcs or back arcs. This huge portion of oceanic crust unit is in the south bordered by a continental Proterozoic crust of **the South Gobi Zone**. This unit is covered with Ordovician continental sediments and Silurian and Devonian passive margin sequences and intruded by numerous Late Carboniferous to Early Permian calc-alkaline to alkaline granites.

A new accretion model assumes: 1) a Devonian to Carboniferous N-S trend of Dabzkhan, Baydrag and Tuva Mongol basement blocks documented by the shape of Cambrian suture (Paleo-Asian ocean I), 2) emplacement of Devonian–Carboniferous magmatic arcs during E-W shortening event, 3) thrusting of intra oceanic ophiolites in the Trans Altai Zone over Devonian volcanoclastics during Late Devonian in the E-W direction, and 4) ductile E-W Late Carboniferous to Early Permian shearing in the basement rocks of the South Gobi Zone. All that suggests that the early Devonian back arc spreading was replaced by 50 to 80 My lasting E-W compressive regime during prolonged activity of north trending Mongol–Okhotsk Pacific type subduction zone. The change in tectonic movements from E-W to N-S is responsible for oroclinal bending of trail of Mongolian microcontinents and scissor-like closure of Mongol Okhotsk (Pacific ocean embayment) ocean.

Both crustal growth and crustal construction are episodic in the CAOB. The former process occurred in two main episodes related to Pacific subduction, while the continental construction is a complex sequence of two peri-Pacific tectonic events followed by typical Tethysian collision responsible for final accretion and growth of Asian continent. Consequently, the CAOB contains geochemical fingerprints (Nd-Sm) and crustal structure typical for both accretionary and collisional orogens. We show geophysical and geochemistry features suggesting a major lower crust redistribution underneath the CAOB crust which modify crustal composition and play a major role in the formation of modern continents.