TECTONICS OF SOUTHERN MONGOLIA AND ADJACENT AREAS

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Geologically, southern Mongolia is located south of the Main Mongolian Lineament and extends into northern China. The geology of southern Mongolia and northern China is subdivided into twenty one terranes which are genetically classified into the following types: cratonal, metamorphic, passive continental margin, island arc, backarc/forearc basin, accretionary wedge and ophiolite. Strike-slip faults and regional shear zones have dismembered many terranes such as island arcs, and associated basins.

There are four cratonal terranes, Tsagaanuul-Guoershan, Hanshan, Hutaguul-Xilinhot and Langshan , whose basement consists of Proterozoic gneiss, migmatite, mica-quartz schist, marble, stromatolitic limestone and phyllite. Gneiss in the Xilinhot area has a Sm-Nd isochron age of 1025± 41 Ma (Xu et al., 1996), and migmatite in the Beishan block, China has a Rb-Sr isochron age of 649± 56 Ma, and a Sm-Nd model age of 1774± 42 Ma (Zuo and Li, 1996). These terranes are overlain by Cambrian to Permian volcanic and sedimentary rocks and intruded by Paleozoic to Mesozoic granite plutons.

The Nuhetdavaa-Uliastai passive continental margin terrane mainly contains Neoproterozoic marble, quartzite, and limestone, Cambrian to Devonian volcanic-sedimentary rocks (490 Ma; Nan and Guo, 1992), containing brachiopods (Tuvaella gigantea) of Siberian affinity (Rong Jia-Yu et al., 1995).

The Tsel-Qinghe terrane is a metamorphic type which includes several scattered blocks of polymetamorphosed tonalitic gneiss, amphibolite, schist, marble containing microplant fossils (He et al., 1990). These rocks were intruded by crustal melt muscovite-biotite-garnet granites that have U-Pb zircon ages of at 370Ma and 385 Ma, and a Rb-Sr isochron of 317± 18 Ma (Bibikova et al. 1992; Zuo et al., 1988).

Island arc terranes are widely distributed in southern Mongolia and adjacent areas of China and mainly consist of Lower to Middle Paleozoic tholeiitic to calc-alkaline basalt, andesite and volcaniclastic sandstone and dismembered ophiolites intruded by diorite and granodiorite plutons (Lamb and Badarch, 1997). There are nine terranes, Baytag-Armantai, Edren, Mandalovoo, North Tienshan, Hashaat-Yagan, Gurvansayhan, Enshoo-Hegenshan, Dongqiyishan, and Duulgant-Baoerhantu. The Duulgant-Baoerhantu, Dongqiyishan, Hashaat-

Yagan terranes mainly contain Ordovician to Silurian arc-related volcanic and sedimentary rocks, whereas the remaining terranes chiefly consist of Devonian to Lower Carboniferous tholeiitic pillow lavas, and volcanic-sedimentary sequences. Basalt from the Ondor Sum ophiolite in the Baoerhantu terrane has a Rb-Sr isochron age ranging from 630 to 520 Ma (Tang, 1990).

The backarc/ forearc terranes are Baaran, Gobi Altai and Atasbogd-Barkol. The Baaran terrane consists of Devonian and Lower Carboniferous fossiliferous volcaniclastic rocks, trachyandesite, shoshonite, latite, tuff, and is intruded by Middle to Upper Carboniferous granite plutons. The Gobi Altai and Atasbogd terranes mainly contain Ordovician to Silurian sedimentary rocks, and Devonian to Carboniferous volcanic and volcanic-sedimentary rocks that contain lenses of ultramafic rocks.

The Sulin-Linxi and Zoolen accretionary wedge terranes are represented by narrow linear belts of highly deformed and metamorphosed sedimentary and volcanic rocks containing melanges, and fragments of ophiolitic rocks. Ophiolitic gabbro in the Enger Us melange of the Sulin-Linxi terrane has a Rb-Sr isochron of 365 Ma (Tairan, 1993).

The Bidz ophiolitic terrane consists of tholeiitic pillow basalt, tuff, chert, sandstone, siltstone, argillite, and minor, thin layers of limestone, intruded by gabbro and diorite. The age of the volcanic and sedimentary rocks is presumed to be Ordovician to Devonian. Major and rare earth element data suggest that these basalts are MORB- type and formed at an oceanic ridge (Ruzhentsev et al., 1992).

The synthesis of the basement geology of southern Mongolia and adjacent areas of northern China provides a framework for a preliminary tectonic model of the Phanerozoic history of this region. In Cambrian to Early Ordovician time the Paleoasian ocean was situated north of the Tarim and Sino-Korean cratons. During the Middle Ordovician to Late Silurian the Atasbogd-Baoerhantu island arc system, consisting of the Atasbogd-Barkol, Hashaat-Yagan, Duulgant-Baoerhantu terranes developed along the southern margin of the Paleoasian ocean. In the latest Silurian to Early Devonian the arc system collided with the Tsagaanuul-Xilinhot continental block represented by the Hanshan, Hutaguul-Xilinhot, and Tsagaanuul - Guoershan terranes and and the Tarim and Sino-Korean cratons. During this time, the northern part of this region was a marine basin, situated near southern margin of the Siberian craton. Remnants of the basin are preserved in the basement of the Gobi Altai, Mandalovoo, Bidz, and Nuhetdavaa-Uliastai terranes. In Devonian to Early Carboniferous time the South Mongolian island arc systems developed near a continent or on the outer edge of the sedimentary shelf of a continent (Lamb and Badarch, 2000). The island arc system is

preserved in the Baaran, Baytag-Armantai, Edren, Gobi Altai, Mandalovoo, North Tienshan, Gurvansayhan, Enshoo-Hegenshan, and Zoolen terranes. The Sulin-Linxi island arc system (or terrane) developed in the southeastern part of the region during the Devonian to Permian. The South Mongolian island arc system collided with surrounding consolidated blocks in the Middle to Late Carboniferous, whereas accretion of the Sulin-Linxi island arc system was completed in the Triassic (Chen et al., 1990).

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