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Magmatism in Tsagaandelger, Eastern Mongolian Volcanic belt: Petrological and Isotopic Constraints on Mesozoic Geodynamic Setting

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During the Mesozoic period voluminous volcanic and plutonic rocks were emplaced as a belt in Central and Eastern Mongolia. The Mesozoic belt is known as Mongol – Okhotsk belt and it extends through Trans – Baikal region toward the Uda gulf in Okhotsk Sea. It is sandwiched between North Asian and Sino – Korean continents. The studied area corresponds to the Middle Gobi volcanic-plutonic belt. Based on lithological characteristic, the Middle Gobi volcanic-plutonic belt was formed in continental rift zones. The belt is interpreted as complexes of the Andean type continental margin and transform margin of the Mongol – Okhotsk paleo-ocean basin. Şengör and Natal'in (1996) regarded it simply as part of the Mongol - Okhotsk oceanic gulf. We studied igneous complexes in Tsagaandelger area in the western part of Mongol – Okhotsk belt to clarify the tectonic environment of the Mesozoic Mongol - Okhotsk belt. The rocks in the Tsagaandelger area piled up intermittently from the Devonian to the Oligocene. The interpreted oldest rocks are Devonian sedimentary formations in the study area. Those sedimentary rocks were intruded by Carboniferous granitoids and Au-poly metal ore bearing skarn was formed in its contact zone. In the Early Permian, felsic volcanic and plutonic rocks were emplaced. In the Late Permian tuffaceous sediments were deposited in the study area. Due to vast distribution of the Mesozoic igneous rocks and sediments, above mentioned Paleozoic units were lacking in outcrop and only exposed in the southern part of the study area. Mesozoic units are dominant in the Tsagaandelger area. The Mesozoic units in the study area vary upwards from alkaline trachytic rocks through tuffaceous sediments to calc – alkaline leucocratic granite and covered by calc – alkaline andesite and calc – alkaline bimodal volcanic rocks consisting of basalts and rhyolites.
The most noticeable feature for the Mesozoic volcanic and plutonic rocks in Tsagaandelger is their near-zero to positive εNd(T) values and young Sm – Nd TDM2 ages. Such features are very common in the Phanerozoic granite in Central Mongolia as well as in entire Central Asian Orogenic belt (Jahn, 2004). The Middle Triassic volcanic rocks have low Sr initial isotopic ratios and positive εNd(T) values with model ages (TDM2) of 0.68 to 0.95 Ga. The Late Triassic granites have high Sr initial isotopic ratios with positive εNd(T) values range and model ages (TDM2) range from 0.79 to 0.94 Ga. The Middle Jurassic gabbros show low Sr initial isotopic ratios and positive εNd(T) values of + 1.8 to + 2.4 with model ages (TDM2) from 0.76 to 0.81 Ga. Moreover, Late Jurassic volcanic rocks (87Sr/86Sr)i ratios of 0.705 – 0.708 and near zero εNd(T) values of - 0.2 to + 2.1 with the model ages (TDM2) from 0.77 to 0.96 Ga. With newly obtained Rb-Sr geochronology results, stratigraphic column and geologic history are modified. Emplacement ages for Late Mesozoic molasse formations must be re-considered.The isotopic compositions limit the participation of old crustal rocks in the generation of the Mesozoic volcanic and plutonic rocks in Tsagaandelger. This is largely compatible with the general scenario for much of the Phanerozoic granitoids emplaced in the Central Asian Orogenic Belt. Our result implies that studied rocks were emplaced in mature arc and crust was thickening during the Triassic and thinning with gabbroic underplating during the Jurassic. The study contributes to the discussions on tectonic setting of the Mongol – Okhotsk orogenic belt. The Mongol Okhotsk ocean basin was subducting toward SE, in present coordinate, beneath the Mongolian – North China microcontinent and crust was thickening through the Triassic. The extension regime might start in Middle Jurassic in the western part of the Mongol – Okhotsk belt or in Central Mongolia.