Pressure–temperature–time conditions of metamorphism pelitic gneisses in the Gobi-Altai Mountains from southwestern Mongolia.

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The metamorphic rocks distributed over the Mongolian Altai and Gobi-Altai Mountains in Southwestern Mongolia, are geographically dispersed in the Bulgan, Uyench, Tseel, Tsogt, and Erdene areas from west to east. In this study, we investigate the metamorphic rocks in the Erdene area (Gobi-Altai Mountains) using petrographical, geochemical, and geochronological approaches. Five amphibolite-facies pelitic gneisses containing assemblages of garnet + aluminosilicates were analyzed in this study. Two samples contain sillimanite in the matrix and/or sillimanite inclusions in garnet. We found kyanite from other two samples; one sample contains kyanite in the matrix and another sample contains symplectic kyanite with staurolite and quartz replacing cordierite. Remaining sample contains andalusite inclusions in garnet rim and in the matrix. Garnet grains from three pelitic gneisses which contain kyanite or andalusite exhibit prograde zoning pattern with decreasing Mn and Ca and increase of Mg and Fe contents from core to rim. Two sillimanite-bearing samples contain garnet grains showing flat pattern for major elements concentrations with Mn-enrichment in the thin rim. Based on the thermobarometric calculations, the P–T conditions of two kyanite-bearing samples yielded 6.2–8.2 kbar and 598–668°C, whereas those of two sillimanite-bearing samples are 3.8–8 kbar and 590–740°C. Although we could not obtain any pressure condition from the andalusite-bearing sample due to absence of plagioclase, the calculated temperature condition is 550–650 °C. The U–Th–Pb monazite dating from all five samples yielded similar ages of c. 270 Ma, which correspond to the timing of collision in Mongolian Altai Mountains. These dating results together with previously published ages may imply that the metamorphic rocks across the Mongolian Altai and Gobi-Altai Mountains can be regarded as a single metamorphic belt. Similar age compared to previously published ages and various P–T conditions are still obscure, but they strongly indicate large pressure differences during continent-continent collision, which will be discussed with additional dataset in this presentation.

Keywords: aluminosilicates, P–T conditions, monazite dating, Gobi-Altai Mountains, Mongolia

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