



Age and P-T Conditions of the Gridino eclogite in the Belomorian Province, Russia

Huanglu Yu (1), Lifei Zhang (1), and Jinghui Guo (2)

(1) MOE Key Laboratory of Orogenic Belt and Crustal Evolution of MOE, School of Earth and Space Sciences, Peking University, Beijing, 100871, China (yuhuangu@163.com), (2) State Key Laboratory of Lithospheric Evolution, Institute of Geology and Geophysics CAS, Beijing, 100029, China(jhguo@mail.iggcas.ac.cn)

The Russian Belomorian eclogite was once regarded as Archean in age and the oldest eclogite in the world. However, its Archean age is disputed. The Gridino eclogite, the abundant eclogite in Belomorian province, is located in the southwest of the Paleoproterozoic Lapland-Kola collisional orogeny, and occurs as boudins and metamorphosed dykes within the tonalite-trondhjemite-granodiorite (TTG) gneisses. Zircons from these eclogites have magmatic cores and metamorphic rims. Metamorphic rims, which contain typical metamorphic mineral inclusions of omphacite and garnet, and are characterized by low Th/U ratios (< 0.035) and flat HREE patterns, yield a U-Pb age of ca. 1.90 Ga. The $\delta^{18}\text{O}$ values of 6.23 to 6.80 ‰ of zircon rims are acquired during the eclogite-facies metamorphism. On the contrary, zircon cores display higher Th/U ratios 0.18-0.45, negative Eu anomalies and strong enrichment in HREE and have Neoproterozoic U-Pb ages of ca. 2.70 Ga. $\delta^{18}\text{O}$ values of 5.64 to 6.07 ‰ suggest the possibility of crystallization from slightly evolved mantle-derived magmas. A three-stage metamorphic evolution has been recognized in the Gridino eclogite based on phase equilibria modeling: prograde epidote amphibolite facies, peak eclogite facies and retrogressed high-pressure granulite facies. The peak metamorphic P-T conditions (790-815 °C, 21-22 kbar) give an apparent geothermal gradient of 11-12 °C/km for Lapland-Kola collisional orogeny during Paleoproterozoic. The Gridino eclogite is not Archean, but the known oldest Paleoproterozoic eclogite, which may respond to the assembly of Columbia supercontinent.