HP-UHP metamorphic complexes of Kyrgyz Tien-Shan

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The Kyrgyz North Tien Shan (NTS) is located in the southwestern Central Asian Orogenic Belt. It represents an early Paleozoic accretionary collage built upon a Precambrian basement and later undergone deformations in middle-late Paleozoic and Cenozoic times (Bakirov, 1999). That collage has a complex fold-and-thrust structure and includes fragments of Precambrian microcontinents (the basement) and Early Paleozoic oceanic and island-arc ophiolites (Djalair-Naiman and Kyrgyz-Terskey suture zones). The basement of the NTS consists of Meso- to Neoproterozoic gneisses and supracrustal rocks assigned to the North Tien Shan (Issyk-Kul) microcontinent. The Mesoproterozoic rhyolite-basalt formations, black shales and schistosed granitoids, Neoproterozoic quartzites and metamorphic schists and lower Paleozoic volcanic and terrigenous formations crop out among numerous and voluminous Paleozoic granitoids (Bakirov et al., 2017; Orozbaev et al., 2010; 2015). The metasedimentary strata and granite–gneisses crop out in the Makbal and Burkhan anticlinoria in the western part of the Kyrgyz Range. All those units were amalgamated during several accretionary events during the Cambrian and Ordovician and underwent further reworking in island-arc and collisional settings during the Middle and Late Paleozoic. The whole structure of the collage was strongly folded and uplifted during the Cenozoic as a result of the India-Eurasia collision. The North Tien Shan is separated from the Middle Tien Shan by the Nikolaev Line. The North Tien Shan microcontinent, as well as other microcontinents in the western CAOB were probably rifted off the Rodinia supercontinent in late Neoproterozoic early Cambrian time, which breakup formed an oceanic basin surrounded by ensimatic (intra-oceanic) active margins with back-arc basins (Cambrian-early Ordovician?), ensialic (continental) active margins (middle-late Ordovician), and passive margins.

We studied eclogites and related high-pressure metamorphic rocks occur in the Aktyuz area, Zaili Range of the Northern Kyrgyz Tien-Shan, which are located in the south-western segment of the Central Asian Orogenic Belt. The Aktyuz area includes the Aktyuz Formation and the Kemin Series (Bakirov, 1978; Bakirov et al., 2003). The Aktyuz Formation consists mainly of pelitic and granitic gneisses containing lenses and layers of eclogite, garnet amphibolite, and amphibolite bodies. The Kemin Series includes the Kopurelisai, Kapchygai and Kokbulak Formations. The

Kopurelisai Formation consists of metagabbros, metabasalts, serpentinites and metapelites, and these are probably constituents of an ophiolite (Bakirov et al., 2003). The Kapchygai Formation is composed of basic migmatites, amphibolites, metagabbros, eclogites, serpentinites and talc schists. The Kokbulak Formation consists of pelitic and carbonaceous migmatites, pelitic gneisses, siliceous schists and marbles. The Kemin Series is intruded by granitic rocks ranging from Proterozoic to Lower Paleozoic in age (1296 ± 96 Ma, 743 ± 33 Ma and 532 ± 46 Ma; Kiselev, 1999).

Eclogites are preserved in the cores of garnet amphibolites and amphibolites that occur as boudins and layers (up to 2000 m in length) within country rock gneisses. The textures and the mineral chemistry of the Aktyuz eclogites, garnet amphibolites and country rock gneisses record three distinct metamorphic events. In the eclogites, the first medium-pressure and high-temperature metamorphic event of amphibolite/epidote-amphibolite facies conditions (T = 560-650°C, P = 4-10 kbar). The eclogites also record the second high-pressure and low-temperature metamorphism with a prograde stage passing through epidote-blueschist facies conditions (T = 330-570°C, P = 8-16 kbar) to peak metamorphism of the eclogite facies (T = 550-660°C, P = 21-23 kbar) and subsequent retrograde metamorphism to epidote-amphibolite facies conditions (T = 545-565°C and P = 10-11 kbar) that defines a clockwise *P-T* path. The third high-pressure and high-temperature metamorphic event is obtained from the garnet amphibolites and surrounding country rock gneisses. The peak mineral assemblage of the country rock gneisses indicates T = 635-745°C and P = 13-15 kbar. The three metamorphic events inferred for the Aktyuz high-pressure metamorphic rocks occurred in three distinct tectonic settings: i) metamorphism along the hot hanging wall at the inception of subduction, ii) subsequent subduction zone metamorphism of the oceanic plate and exhumation, and iii) continent-continent collision and exhumation of the entire metamorphic sequences.

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