Diachronous Early Palaeozoic high-pressure metamorphism in the North Balkhash ophiolite zone (Central Kazakhstan, west Central Asian Orogenic Belt): tectonic implications

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The North Balkhash ophiolite zone (NBOZ) is located in Central Kazakhstan in the central part of the Junggar-Balkhash region (western Central Asian Orogenic Belt). The NBOZ is composed of a serpentinite mélange, which takes up the lowest structural position, and structurally higher Early Palaeozoic volcanogenic-sedimentary formations (Degtyarev *et al.*, 2021). In the serpentinite mélange, varisized blocks of igneous (dismembered fragments of ophiolites, including plagiogranites), metamorphic rocks (eclogites, garnet blueschists, albite blueschists) and metasomatites (including jadeitites) are distributed. Plagiogranites related to the suprasubduction (SSZ) ophiolitic sequence aged at ca. 530-520 Ma record the Early Cambrian stage of intraoceanic convergence within the Junggar-Balkhash Ocean (JBO), whereas the plagiogranites from separate blocks in the NBOZ mélange of 500-480 Ma mark the Late Cambrian-to-Early Ordovician stage of the ensimatic arc system evolution in the JBO. High-pressure metamorphic rocks of the NBOZ include phengite eclogites, garnet-phengite-glaucophane schists and their retrograde analogues, whose peak or near peak assemblages correspond to 17–21 kbar, 480–540°C and 19–23 kbar, 460–510°C, respectively. ^{40}Ar-^{39}Ar phengite ages obtained for the eclogites (ca. 491 Ma) and garnet blueschists (ca. 465 Ma) are referred to their post-peak evolution at eclogite-facies conditions and indicate Late Cambrian and Middle Ordovician episodes of high-pressure metamorphism in the NBOZ. According to chemical compositions, Nd isotope data and geochronology of high-pressure rocks, protoliths of eclogites were Cambrian or older N-MORB-type basalts/dolerites formed at the spreading-center extensional setting from a depleted-mantle source. The first episode of intraoceanic subduction is therefore interpreted to be recorded by high-pressure metamorphism at ca. 491 Ma and accompanying SSZ-magmatism at ~500-480 Ma. Zircons from garnet blueschists exhibit the U-Pb ages within 509–478 Ma, whereas their bulk-rock compositions suggest predominantly mafic, volcanogenic-sedimentary complexes as a source substrate. The accumulation of these complexes was related to the second episode of subduction in the JBO within ~478–465 Ma, limited by the youngest magmatic zircon core age and phengite ^{40}Ar-^{39}Ar age of high-grade metamorphism. Eventually, the ages obtained for metamorphic and igneous formations of the NBOZ correlate well with those of the adjacent complexes in the southern West Junggar area (NW China), that indicates their mutual Early Palaeozoic tectonic evolution within the Junggar-Balkhash Ocean.
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Degtyarev, K.E., Luchitskaya, M.V., Tretyakov, *et al.*, 2021. Early Paleozoic suprasubduction complexes of the North Balkhash ophiolite zone (Central Kazakhstan): geochronology, geochemistry and implications for tectonic evolution of the Junggar-Balkhash Ocean. *Lithos*, 380-381, 105818.