The early Paleozoic tectonic evolution of the southernmost Central Asian Orogenic Belt: Constraints on the Gubaoquan eclogites from Beishan (NW China)

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Eclogites are of great significance for deciphering the processes of plate subduction, collision and tectonic evolution. The Beishan Orogenic Belt is the southernmost component of the Central Asian Orogenic Belt (CAOB), and is one of key areas to reveal Paleozoic tectonic evolution and closure timing of the southernmost CAOB.

In this paper, the U–Pb dating of the Beishan eclogites indicates an Neoproterozoic age of 887±7 Ma for its protolith age and an Ordovician age of 461±15 Ma for the eclogite facies metamorphism. In addition, we obtain its rutile and apatite U-Pb ages are 410±34 Ma and 438±140 Ma, respectively, which are interpreted as the retrograde metamorphism that occurred during later exhumation of the eclogites.

We demonstrate that the protoliths of the Gubaoquan eclogites are of continental origin, mainly based on the following lines of evidence: (1) the Gubaoquan eclogites are exposed with continental rocks, such as garnet–kyanite–phengite–rutile schists and augen felsic gneisses; (2) hardly any of hydrous minerals (chloritoid, epidote or phengite) is recognized in the rocks; (3) the eclogite facies metamorphism has recorded higher temperature, reaching 700-800°C, than that of the oceanic eclogites; (4) geochemical data reveals that it has continental island arc basalt compositions. The protoliths of Gubaoquan eclogites should were part of the Rodinia supercontinent; it experienced eclogite facies metamorphism during the Middle Ordovician, which related to the subudction-collision of ocean between the Beishan and the Dunhuang blocks.