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Middle to Late Ordovician arc in the Kyrgyz Middle Tianshan: From arc-continent collision to subsequent evolution of a continental margin

Alexeiev, D.V.¹, Kröner, A.^{2,3}, Hegner, E.⁴, Rojas-Agramonte, Y.^{2,3,5}, Biske, Yu.S.⁶, Wong, J.⁷, Geng, H.Y.⁷, Ivleva, E.A.⁸, Mühlberg, M.⁴, Mikolaichuk, A.V.⁸, Liu, D.²

¹ Geological Institute (GIN), Russian Academy of Sciences, Moscow, Russia, dvalexeiev@yandex.ru

² Beijing SHRIMP Centre, Institute of Geology, Chinese Academy of Geological Sciences, Beijing, China

³ Institut für Geowissenschaften, Universität Mainz, Mainz, Germany

⁴ Department für Geo- und Umweltwissenschaften, Universität München, Munich, Germany

⁵ Departamento de Seguridad y Defensa, Universidad de las Fuerzas Armadas ESPE, Sangolqui, Ecuador

⁶ St-Petersburg State University, St-Petersburg, Russia

⁷ Department of Earth Sciences, The University of Hong Kong, Hong Kong, China

⁸ Institute of Geology, Academy of Sciences of Kyrgyzstan, Bishkek, Kyrgyzstan

New geological, geochronological and isotopic data reveal a previously unknown Ordovician arc system that evolved south of the Kyrgyz Middle Tianshan (MTS) microcontinent during the period 467-444 Ma ago (Fig. 1). A continental basement of the arc, indicated by predominantly felsic composition of volcanic rocks, is supported by whole-rock Nd- and Hf-in-zircon isotopic data. $\epsilon_{Nd(t)}$ of +0.9 to -2.6 and $\epsilon_{Hf(t)}$ of +1.8 to -6.0 imply melting of Neo- to Mesoproterozoic continental sources. In the north, the arc was separated from the MTS microcontinent by an oceanic back-arc basin, represented by the Karaterek ophiolite belt. Our inference of a long-lived early Palaeozoic arc suggests an oceanic domain between the MTS microcontinent and the Tarim craton during the Middle Ordovician.

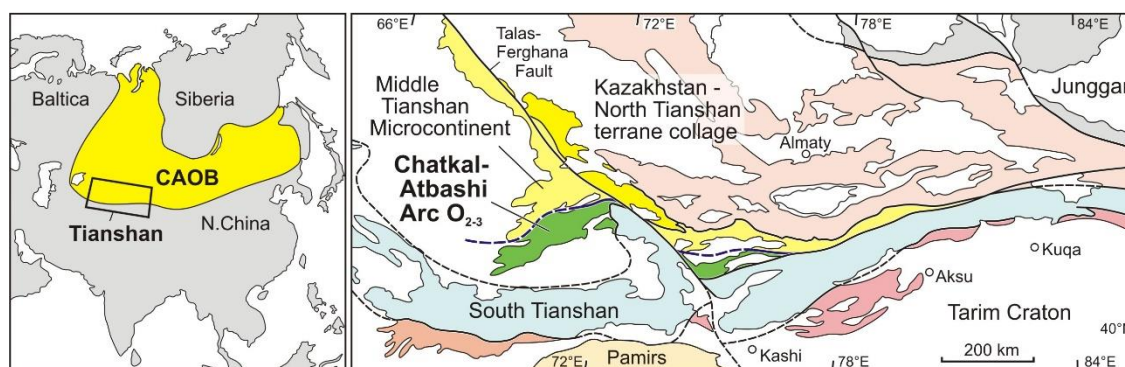


Figure 1: Palaeozoic basement terranes of the Tianshan fold belt, southern CAOB

The time of arc-continent collision is constrained as late Ordovician at ca. 450 Ma, based on cessation of sedimentation on the MTS microcontinent, the age of an angular unconformity within the Karaterek suture zone, and the age of syncollisional metamorphism and magmatism in the Kassan Metamorphic Complex of the Chatkal Range. High-grade amphibolite-facies metamorphism and associated crustal melting in the Kassan Metamorphic Complex restricts the main tectonic activity in the collisional belt to ca. 450 Ma, based on the age of a synkinematic amphibolite-facies granite, intruded into paragneiss during peak metamorphism.

Late Ordovician collision was followed by initiation of a new continental arc in the southern MTS. This arc was active in the early Silurian, latest Silurian to Middle Devonian and Pennsylvanian, whereas during the Givetian through Mississippian (ca. 385-325 Ma) this area represented a passive continental margin. These arcs, previously well constrained west of the Talas-Ferghana Fault, continued eastwards to the Naryn and Atbashi areas and probably extended into the Chinese Central Tianshan. The disappearance of a major crustal block with transitional facies on the continental margin and too short distance between the arc and accretionary complex suggest that plate convergence in the Atbashi sector of the MTS was accompanied by subduction erosion in the Devonian or early Pennsylvanian. This led to a minimum of 50-70 km of crustal loss and removal of the Ordovician arc as well as the Silurian and Devonian forearcs in the areas east of the Talas-Ferghana Fault.

