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Carboniferous and Triassic oceanic crust in the North Pamir: Paleogeographic implications

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The North Pamir is located between the Main Pamir thrust (MPT) in the north and the Tanymas suture zone in the south. It is traditionally subdivided into two paleogeographic domains: The North Pamir-Kunlun domain, dominated by non- to very low grade metamorphic clastic sediments and intercalated volcanic series and the Karakul Mazar domain, characterized by a greenschist to amphibolite facies intraoceanic arc-accretionary complex. The MPT is interpreted as the main Cenozoic convergent structure; understanding its deformation history is crucial to explain the formation of the Pamir salient. Especially in the Chinese Pamir, where the MPT potentially connects with the dextral strike-slip Kashgar-Yecheng Transfer System (KYTS), the position and offset of the MPT is unclear.

We examine the pre-Cenozoic stratigraphy and structure of the Chinese Pamir to constrain Cenozoic structural offsets. Detailed field studies, geochemistry of the volcanic series and detrital and igneous geochronology reveal a long-lasting sedimentary history in the North Pamir-Kunlun domain.

The basal unit is Carboniferous ocean floor. This is part of the Oytagh Rift, also called the Kalai Khumb-Oytagh basin; its southwestern extent is unconstrained. Voluminous plagiogranites intruded a several kilometres thick pile of basaltic lava flows. Zircons from the plagiogranites give early Carboniferous U/Pb ages (e.g. 357±10 Ma Taergilake valley (this study), 328±5 Ma and 338±4Ma Oytagh valley (Jiang et al. 2008)). Remnants of this ocean basin extend along strike from the Gez valley in the Chinese Pamir all the way to Kalai Khumb in the Tajik Pamir, where the plagiogranites give similar ages (340±1 Ma and 354±1 Ma, this study). In the Chinese Pamir, the Oytagh Rift is overlain by a Triassic to Cretaceous volcano-sedimentary sequence, inferred from zircon U/Pb dating (detrital maximum deposition ages and igneous ages, this study). Most of the Permian is missing/eroded, that is in contrast with geological maps. However, a Permian sliver might be present at the base of a klippe of the Karakul Mazar domain. The Triassic sequence shows intense bimodal volcanism and synsedimentary normal faulting. Geochemistry of Triassic mafic volcanics shows spatially discrete MORB and OIB signatures. Jurassic and Early Cretaceous fluvial clastic deposits lie concordantly on top of Triassic mafic volcanics. In the Qimgan valley, to the west of Kashgar, we found a largely undisturbed section of lower Carboniferous to Eocene units. The section is part of a regional anticline and there is no evidence for large scale faulting.

We argue that the Kalai Khumb-Oytagh basin in the Qimgan and Oytagh sction is part of the pre-Cimmerian passive continental margin of the Tarim block. If the MPT accommodated a large amount of shortening, it should be situated more internally and not along the present-day mountain front in the Qimgan section, just west of the KYTS. The occurrence of a Carboniferous ophiolitic sequence and MORB and OIB signature volcanic rocks at the southwestern edge of Tarim also contradicts the hypothesis of a continuation of Tarim cratonic crust beneath the Pamir.

Jiang, Y.H., Liao, Sh.Y., Yang, W.Zh., Shen, W.Zh., 2008, Lithos 106 (3-4), pp. 323–335.