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A geotraverse across two paleo-subduction zones in Tien Shan, Tajikistan

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We present first U-Pb LA-ICP-MS zircon ages, Sr-Nd-Pb isotope and geochemical data from 14 magmatic rocks collected in Mogol-Tau and Kurama ranges and in the Gissar Segment of the Tien Shan orogen in Tajikistan. The new data on two Late Paleozoic active margins allow reconstructions of terrane motions across two paleo-subduction zones along a ca. 400 km profile within the frame of the following tectonic model: (1) The Muzbulak granite with an age of 425 Ma situated in Mogol-Tau range has been formed in a supra-subduction setting on the northern margin of the Paleo-Turkestan Ocean above the subduction zone active from Llandoverian – Wenlockian to the earliest Middle Devonian when after cessation of subduction the northern side of the Paleo-Turkestan Ocean was converted to a passive margin until the Early Carboniferous. (2) In the Early Carboniferous the subduction under the northern margin of the Paleo-Turkestan Ocean resumed and the Kara-Kiya and Muzbek intrusions as well as the Karamazar batholith with ages 315, 311 and 305 Ma, respectively, have been formed in the Mogol-Tau and Kurama ranges. (3) At the same time the southern passive margin of the Paleo-Turkestan Ocean experienced rifting and a short-lived Gissar Basin, separated from the Paleo-Turkestan-Ocean by the Gissar micro-continent, has been formed. The north-dipping subduction in the Gissar basin is documented by the Kharangon plagiogranite intrusion with an age of 315 Ma and by the voluminous Andean-type supra-subduction Gissar batholith emplaced ca. 321 - 312 Ma ago. (4) In the latest Carboniferous, the Paleo-Turkestan Ocean and the Gissar Basin were closed and the Early Permian postcollisional intrusions with ages 297 - 267 Ma have been formed. The postcollisional intrusions, emplaced in the northern part of the Gissar micro-continent after a long period without any magmatic activity, have intra-plate geochemical affinities. The postcollisional intrusions in southern Gissar and in Mogol-Tau and Kurama ranges uninterruptedly followed the supra-subduction series preserving the geochemical signatures of arc-related magmas. The distinct shoshonitic affinities of postcollisional intrusions in Mogol-Tau and Kurama ranges are explained by interaction of hot asthenospheric material with subduction-enriched wedge of lithospheric mantle due to slab break-off at postcollisional stage. The isotopic compositions and ages of inherited zircon grains provide additional information about the sources of magmatic rocks. The plagiogranite intrusions of the southern Gissar range have relatively unradiogenic Sr and Nd compositions ($^{87}Sr/^{86}Sr_{(T)}$ 0.7047 - 0.7056, and εNd of +1.5 to +2.3) compatible with mantle-derived origin typical for gabbro-plagiogranite series associated with ophiolites. The supra-subduction and postcollisional rocks from Mogol-Tau and Kurama ranges and from the Gissar batholith have variably

mixed Sr-Nd-Pb isotopic signatures ($^{87}Sr/^{86}Sr_{(T)}$ 0.7040 - 0.7070, and εNd of –2.1 to –5.0) typical for continental arcs where mantle-derived magmas interact with continental crust. The Chinorsay and the Dara-i-pioz intrusions from the northern part of the Gissar micro-continent have the most radiogenic Sr-Nd-Pb isotopic compositions ($^{87}Sr/^{86}Sr_{(T)}$ 0.7074 - 0.7086, and εNd of –5.5 to –7.4) indicating derivation from Precambrian continental crust. Despite origination from different tectonic environments, all magmatic rocks have old Nd model ages (1.7 - 1.0 Ga) indicating a significant proportion of Paleoproterozoic or older crustal material in their sources and are similar to model ages of postcollisional intrusions from the Alai and Kokshaal Segments of the South Tien Shan.