32) Journal of Asian Earth Sciences

Volume 175, 15 May 2019, Pages 178-198

Contrasting granitic magmatism of the Kalba fold belt (East Kazakhstan): Evidence for Late Paleozoic post-orogenic events(Article)

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The paper presents new original data and a review of previous studies on the Late Carboniferous – Early Permian granitoids of the Kunush and Kalguty intrusive complexes from the Kalba fold belt (East Kazakhstan). These rocks formed at the initial post-collisional stage of the Irtish-Zaisan orogen in the western Central Asian Orogenic Belt (CAOB). The granitoids form isometric or NW linear intrusions inside the Late Devonian - Early Carboniferous metasediments which overlap the accretionary lithology of the Kalba fold belt in front of the Altai active margin of the Siberian continent. These granitoids contain zircon grains with U-Pb ages of ca.308–291 Ma, synchronous with the peak post-orogenic magmatic event at ~300 Ma in the CAOB. The Kunush high-Na granitoids, with high SiO 2 (67–72%) and Al 2 O 3 (15–18%) contents and the Na 2 O/K 2 O ratio (1.94–6.43), and low HREEs (Yb = 0.22–0.93 ppm) but moderate Sr/Y ratios (47–179), Mg# (35–55) and Ni, Cr, are generally common to high-Al TTG-series with non-subduction geochemical signatures. The Kalguty granitoids mostly belong to calc-alkalic to subalkalic high-K series, have non-corundum CIPW-norm compositions and mainly weakly peraluminous (ASI = 0.97–1.09) characteristics. Their Fe∗ = 0.7–1 at 62–74 wt.% SiO 2 and relatively high Y/Nb (2–4) and Rb/Nb (9–18) ratios are similar to transitional compositions reported for fractionated I- and A 2 -type post-orogenic granites worldwide. The Kunush high-Na and Kalguty high-K granitoids formed at different depths in the crust and the parent melts were derived from metabasaltic (MORB; P = 10–15 kbar) and metagranitic (TTG-like; P < 10 kbar) protoliths, respectively. We propose that relaxation of tangential compression after oblique collision and the following thermal impact of mafic magma that acted simultaneously at different crustal depths, along with decompressional partial melting, may be a basic petrological scenario for synchronous formation of geochemically different granitoids.