

Subduction-accretion processes of the Altai-East Junggar-Tianshan collages and their control on metallogeny in the southern Altaids

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The southern Altaids formed during complex accretionary orogenesis and contain many different types of mineral deposits. The Altai-East Junggar-Tianshan collages of North Xinjiang, China consist of several NWW-SEE-trending linear tectonic units that were juxtaposed from North to South. The Chinese Altai and East Junggar collages occupy the northern part. The Chinese Altai collage, composed of variably deformed and metamorphosed Paleozoic sedimentary, volcanic, and granitic rocks, is interpreted as a Japan-type island arc formed during the Paleozoic to Carboniferous-Permian. The Erqis unit occurs immediately south of the Chinese Altai unit, consists of ophiolitic mélanges and coherent assemblages, and contains fragments of Paleozoic accretionary complexes, mostly associated with a major north-dipping subduction zone. The East Junggar collage consists of imbricated ophiolitic mélanges, Nb-enriched basalts, and adakitic volcanic rocks and is regarded as a Devonian-Carboniferous intra-oceanic island arc with some Paleozoic ophiolites, superimposed by Permian arc volcanism. The southerly-distributed forearc accretionary complex of the East Junggar collage suggests a general north-ward subduction polarity for the East Junggar collage. The southern part is the Chinese Eastern Tianshan collage that is characterized by (a) the Harlik-Dananhu subduction system with a S-dipping polarity in the north; (b) a southerly N-dipping subduction system beneath the Central Tianshan arc in the middle; and (c) the South Tianshan ocean against Tarim in the south.

The Chinese Altai-East Junggar collages contain five major metal deposits types closely associated with accretionary and convergent processes: (1) VMS Cu-Pb-Zn, (2) porphyry Cu-Au, (3) magmatic Cu-Ni-sulfide, (4) skarn Cu-Mo-Fe and (5) orogenic Au. Petrotectonic associations include: (i) Late Devonian to Early Carboniferous VMS deposits with some broadly contemporaneous Fe-Cu skarns, located in the accreted Qiongkuer-Talate Terrane in the western Altai, formed during back-arc extension along the the Chinese Altai-East Junggar collages. (ii) Porphyry Cu and Alaskan-type Cu-Ni-PGE zoned ultramafic bodies developed in arcs in the Buerjin-Ertai and Erqis terranes, and Cu-Fe skarns formed in the Erqis flysch basin, formed during Carboniferous to Permian terrane accretion and arc magmatism. (iii) Cu-Mo skarns and orogenic-type gold vein systems formed during continuing accretion in the Permian with the development of the Dulate arc in the southern Altai.

The mineralization processes in the Chinese Eastern Tianshan collage were mainly related to an island arc stage (360-320 Ma) with porphyry-type and volcano-sedimentary copper deposits, an accretionary stage (300-280 Ma) with orogenic-type gold deposits, an accretionary to post-accretionary stage (280-245 Ma) with mafic-ultramafic copper-nickel

and epithermal gold deposits, and a post-tectonic extensional stage (240–220 Ma) that gave rise to the Jinwuzi gold deposits, Xiaobaishitou skarn W–Mo deposits, and Baishan porphyry Mo–Re deposits.