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Relationship of crustal evolution and collage assembly to metallogenesis of China

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Due to the complexity of geological settings in China, a variety of metallogenic settings are well developed, such as Proterozoic rift, collision, and plume. China is rich in Mo, W, Sn, Sb, Hg and REE but short of Cu, high-grade Fe, Al and sylvite. China lacks Early Precambrian mineral deposits, but has abundant Yanshanian mineralization. The relationship between these mineralization styles, formation and evolution of small continental blocks, and accretionary collage of microcontinents is not well understood. We describe here the formation and evolution features of small continental blocks in China, and their relationship to mineralization. The key features are: (1) The mass ratio of platform over orogens in China (about 3:7) is smaller than that of the bulk Earth (about 7:3). Areas of Archean crust in China are small and widely separated. The consolidation of the Chinese continental crust took place 500~1000Myr later than shield areas elsewhere in the world. All of these features resulted in the lack of high-grade BIF deposits, giant Archean VMS Cu-Zn deposits, and Proterozoic rift-related Zambia-style giant Cu deposits. (2) The continental crust of China was formed through the accretion of several blocks. With old massifs as the cores and orogenic systems of different ages at the margins, Chinese continental crust progressively accreted and grew outwards, leading to the migration of volcanic intrusive activity as well as, sites of sedimentation and related mineralization towards the margins of the cratonic core with time. (3) The Central Asian Orogenic Belt (CAOB) has experienced a Paleozoic accretionary collage of microcontinents, and Mesozoic-Cenozoic intra-continental orogenesis, thus the CAOB can host arc-related mineral deposits (e.g. chromite, porphyry Cu-Au and VMS deposits), collision-related deposits (e.g. orogenic gold, asbestos and talc deposits), ore deposits related to unusual overlapping CAOB by Early Permian Tarim plume (Cu-Ni-Co deposit), and intra-continent extensional environment (porphyry Mo, hydrothermal Au and pegamatite rare metals, sylvitedeposits). (4) Numerous large porphyry Cu-Au-Mo deposits, MVT Pb-Zn, and ophiolite Cr deposits were generated during the evolution of Proto-Paleo-New Tethyan oceanic subduction along the Qilian, Kunlun to Bangongcuo-Nujiang and Yarlung-Zangbo sutures and the India-Asia continental collision in the Qinghai-Tibetan orogen. (5) Crustal movements in China, especially in Eastern China, were more frequent and stronger than orogenesis in other parts of the world. Magmatism and Au, Mo deposits around the North China Craton occurred in the Late Mesozoic during the breakup of North China lithosphere. A large number of world-class W, Sn, and Mo deposits occurred with highly evolved granitoids in the mature East China continent, related to the polycyclic nature of the tectonism, magmatism, and sedimentation. As all the metallogenic features are genetically associated with the evolution of continental crust and multi-stage orogenesis, mineral exploration in China should focus on the evolutionary features of small continental blocks and the accretionary collage of microcontinents.