The Sanjiang region in Yunnan (southwestern China) and its adjacent mainland SE Asia comprises a complex collage of microcontinents including the Indochina, Sibumasu and West Myanmar Terranes (Zhong, 1998; Metcalfe, 2002). Within these microcontinents, there are a number of suture zones that represent the remnants of the three Tethyan Oceans (Paleo–Tethys, Meso–Tethys and Ceno–Tethys) and their branches or oceanic backarc basins that once existed in this region (Li et al., 2004; Metcalfe, 2013).

1 Deposit Types and Metallogenic Epochs

By summarizing and correlating the characteristics of ore deposit types in the Sanjiang and mainland SE Asia regions (Hou et al., 2007; Khin Zaw et al., 2007, 2013; Deng et al., 2013a, 2013b; Wang et al., 2013), eleven major types of ore deposits (e.g., VHMS Cu-Pb-Zn-Ag, SEDEX Pb-Zn-Cu-Ag, basin–related Pb-Zn-Cu-Ag-Co, porphyry–related skarn Pb-Zn-Cu-Ag-Sn-Fe, porphyry/porphyry–related skarn Cu-Au(Mo), epithermal Au-Ag, sediment–hosted/orogenic Au, sediment–hosted Carlin–like Au -As-Sb-Hg, cassiterite–quartz vein/greisen/pegmatite Sn– (W), magmatic sulfide Cu-Ni and hot spring Au) and eight mineralization epochs (e.g., Early Paleozoic–Early Mesozoic) have been identified.

2 Regional Tectono-Metallogenic Correlation

We suggest that the opening and closure of the Tethyan oceans and the collision between the microcontinents have played a major control to the metallogenic relation in the region (Hou et al., 2007; Khin Zaw et al., 2007, 2013; Deng et al., 2013a, 2013b). During the evolution of the Prototethyan margin (Ordovician to Silurian) and Paleo–Tethys (Devonian to Triassic), continental rifting and generation of ocean basins together with the Early Paleozoic opening phase have led to the formation of SEDEX Pb-Zn-Cu-Ag deposits (e.g., Silurian Mengnuo Pb-Zn deposit, Yunnan) in continental passive margin, as well as VHMS Cu-Pb-Zn-Ag deposits (e.g., Silurian Dapingzhang deposit, Yunnan; Cambro–Ordovician Bawdwin deposit, Myanmar) in ocean basin/supra–subduction backarc basins that once existed in this region (Li et al., 2004; Metcalfe, 2013).

In the Late Paleozoic–Early Mesozoic closure phase, ore deposits are mainly represented by porphyry–related skarn/epithermal Cu-Au deposits (e.g., Late Permian Chatree epithermal Au-Ag deposit, Thailand) along an Andean–type continental magmatic arc. This is followed by syn–collisional sediment–hosted/orogenic gold deposits along the sutures (e.g., Triassic Selinsing Au deposit, Malaysia), together with late–to post–collisional granitoid–related Sn–(W) deposits (e.g., Late Triassic–Early Jurassic Shiganghe deposit, Yunnan). Among these Prototethyan and Paleotethyan deposits, we suggest that the porphyry–related skarn/epithermal Cu-Au (-Mo) deposits and sediment–hosted/orogenic Au deposits are the most important exploration targets.

The Early Cretaceous porphyry–related skarn Pb-Zn-Cu-Ag-Sn-Fe deposits (e.g., Late Cretaceous Shizhishan deposit, Yunnan) and Late Cretaceous–Paleocene granitoid–related Sn–(W) deposits (e.g., Xiaolongsan and Lailishan deposits, Yunnan) are the main deposit types associated with the evolution of Meso–Tethys. Late Cretaceous–Paleocene granitoids are associated with the Sn–mineralized belt in mainland SE Asia which extends over...
several 1000km (from Tengchong Yunnan, through central Myanmar, west Thailand and west of central Mountain Ranges of Malaysia, to Sungai Rokan Sumatra). The types of deposits associated with Ceno–Tethys are mainly high sulfidation epithermal Cu - (Au) deposits (e.g., Miocene Monywa deposit, Myanmar) and epithermal/ sediment–hosted Au-Ag deposits (e.g., Kyaunkphyo deposit, Myanmar).

Cenozoic basin-related Pb-Zn-Cu-Ag-Co (e.g., Paleogene Jinding deposit, Yunnan) are mainly hosted in Meso–Cenozoic mottled clastic rocks and strictly controlled by the Cenozoic thrust systems (Hou et al., 2008). Eocene porphyry/porphry–related skarn Cu-Mo-Au deposits (e.g., Eocene Baiya deposit, Yunnan) occur in the non–arc settings, and related to melting of thickened mafic lower crust. These two types of deposits have significant exploration potential in Sanjiang and mainland SE Asia. Their metallogenesis were associated with the collision between Indio and Eurasia continents, which correspond to the main– and late–collisional stages of the Indo–Asian orogeny.

3 Implications for Exploration

Interestingly, although the Sanjiang Region and the neighbouring mainland SE Asia show a similar geologic and metallogenic setting, mineral deposit discoveries in these two regions have certain differences. For instance, world–class basin–related Pb-Zn and Cu - Ag-Co deposits of Paleogene age have been discovered in the Langping–Simao basin, but large deposits of these types have not yet found in its southern continuation in the Indochina and Sibumasu terranes. In addition, economically important Permian–Triassic porphyry– related skarn/epithermal Cu-Au-Mo deposits have been widely documented along the Truong Son and Loei fold belts in the Indochina Terrane, yet similar deposits remain largely unknown in their northern extension along the western Ailaoshan Fold Belt in SW Yunnan. The distribution of ore deposits above suggests an enormous mineral potential in both the Sanjiang and mainland SE Asia regions, and metallogenic research on these two regions will be critical in future mineral exploration and discovery.

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References


