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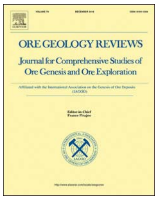

Editorial: Metallogeny associated with multiple orogenesis in the Tethyan domain: Preface

1. Introduction

The Tethyan tectonic domain in Tibet, Sanjiang, and Qinling–Qilian–Kunlun, China is characterized by the spatial overlap between the accretionary orogenesis during the evolution of Tethyan oceans and the India–Eurasia continental collision (Deng et al., 2017c). The accretionary orogenesis produced the ophiolite belt, continental arc, stitching granitoid plutons, as well as intracontinental basin (Deng et al., 2014a). In Sanjiang, the oblique continental collision resulted in the (ultra-) potassic magmatism, development of continental basins, and large-scale crustal shears (Deng et al., 2014b). In Tibet, the normal collision belt, is illustrated by the lithosphere thickening, thrust fault parallel to and extensional fault perpendicular to the collision front, and adakite-like magmatism (Yin and Harrison, 2000). The metallogenic types in these two types of orogenesis are different. The earlier episode of orogeny in the superimposed orogenic system generated juvenile lower crust through mantle melt input and thickened the crust. The accretionary orogenesis is characterized by subduction-related porphyry Cu and skarn Cu–Mo deposit, skarn and greisen Sn deposit, and VMS ore deposit (Deng et al., 2014a). In contrast, the continental collision setting is marked by intracontinental porphyry deposit, orogenic Au deposit (Deng et al., 2015a, b), and sediment-hosted base metal deposit (Deng et al., 2014b). In the later orogeny, the juvenile lower crust, ancient lower crust, and middle crust underwent melting and mixing of magmas derived from the different sources, which was more inclined to generate a wide variety of combinations of metal species for the intrusion-related ore deposit (Deng and Wang, 2016; Deng et al., 2017c). The superimposed orogeny caused multiple episodes of magmatism and associated metallogeny overlapped in one tectonic unit, such as two episodes of metallogeny at 230–210 Ma and 100–80 Ma occurred in the Yidun Arc (Li et al., 2017).

The scientific significance of the superimposed orogensis and its controls on metallogeny prompted us to organize this special issue of *Ore Geology Reviews* on "Metallogeny associated with multiple orogenesis in the Tethyan domain". This special issue includes 21 papers, among which 14 are focused on investigations related to the genesis of diverse ore deposit, including porphyry-skarn (9), sediment-hosted Pb–Zn (3), hot spring-type (1), and sedimentary bauxite (1), one study on post-mineralization uplifting, 7 articles on the metallogenic background including petrogenesis of igneous rocks related to the Tethyan evolution (4), geophysical crustal structure (1), and stream sediment geochemical pattern (1).

2. Types of ore deposits

2.1. Porphyry

Li et al. (2017–in this issue) present an overview of the Mesozoic two-stage magmatism and related porphyry Cu–Mo (W) mineralization in the Yidun Arc (Fig. 1). The Late Triassic (221–213 Ma) and the Late Cretaceous (88–80 Ma) magmatism and mineralization were superimposed in the Xiangcheng–Shangri-La district. The continuity and inheritance of multiphase magmatism and the new understanding of superimposed mineralization would help to guide future exploration.

Yang et al. (2017a–in this issue) reported new data on zircon U–Pb and molybdenite Re–Os geochronology for the multiple Mesozoic porphyry-skarn Cu (Mo–W) systems in Yidun Arc (Fig. 1). The results indicate a genetic link between the Late Triassic and Late Cretaceous porphyry systems, that proposed that the formation of the Late Cretaceous porphyry–skarn Cu–Mo–W deposits could most likely be related to the remelting of Late Triassic residual sulfide-bearing Cu-rich cumulates in the subduction-modified lower crust that triggered by the Late Cretaceous transtension.

Yang et al. (2017b–in this issue) investigate the control of magmatic oxidation state in porphyry Cu (Mo–Au) deposits in the Jinshajiang–Red River porphyry metallogenic belt that formed at 43.3–33.0 Ma. The authors suggest that oxygen fugacity was an important factor that led to the differentiation of deposit size in the Jinshajiang–Red River metallogenic belt, and that larger porphyry deposits were associated with more oxidized magmas.

He et al. (2017a–in this issue) provide new evidence for hydrothermal evolution and ore genesis of the Beiya giant Au polymetallic deposit which formed at ca.36 Ma , located in the Jinshajiang–Ailaoshan metallogenic belt. The ore–forming fluid evolved from high-temperature (398–560°C), hypersaline (48.81–67.24 wt. % NaCl equiv.) hydrothermal fluids in stage I, through stage II and Stage III, to lowest homogenization temperatures (157 − 272°C) and the lowest salinities (1.06 − 12.20 wt. % NaCl equiv.) in stage IV. The ore-forming fluids were dominated by magmatic water in Stage I and Stage II, and gradually mixed with circulating meteoric water during Stage III and Stage IV.

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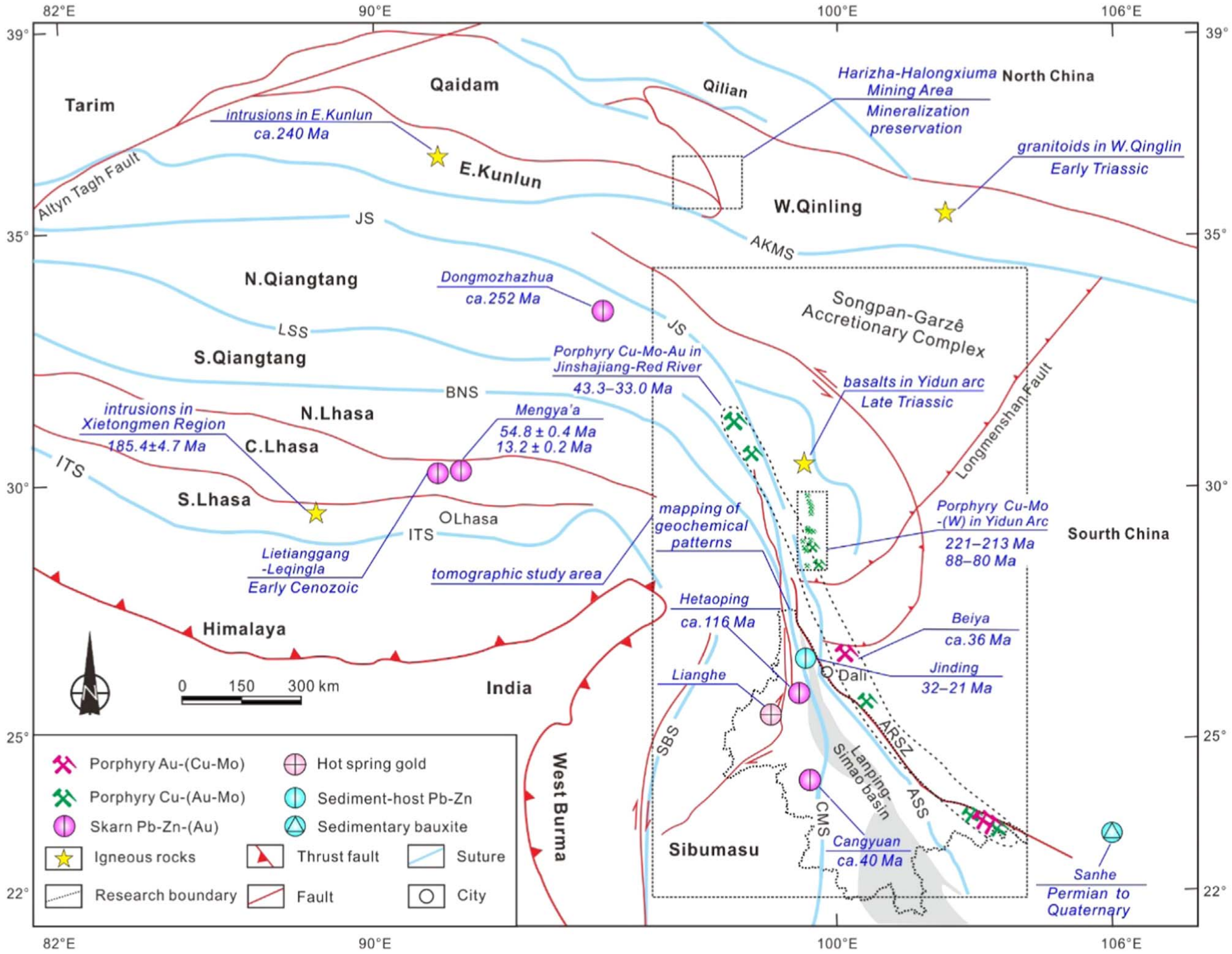

Fig. 1. The Tethyan metallogenic province in China formed in the background of superimposed orogeny. Abbreviation: AKMS = Anyimaqin–Kunlun–Muztagh suture, JS = Jinshajiang suture, BNS = Bangong–Nujiang suture, ITS = Indus-Tsangpo suture, SBS = Shan boundary suture. AKMS = Ayimaqin-Kunlun-Muztagh Suture, JS = Jinsha Suture, BNS = Bangong-Nujiang Suture, ITS = Indus–Tsangpo Suture, SBS = Shan Boundary Suture, CMS = Changning–Menglian Suture, ASS = Ailao Shan Suture, ARSZ = Ailaoshan–Red River Shear Zone, MBT = Main Boundary Thrust. Geological map is revised from Deng et al., (2017c). Locations/regions covered by the various papers in this special issue are also shown in the figure.

2.2. Skarn

Zhang et al. (2017–in this issue) summarise the deformation and ore textures associated with fault zones that controlled the lead–zinc mineralization of the Dongmozhazhua deposit, central Tibet. This study reveals that the ore-bearing fluids in the Dongmozhazhua deposit (ca.252 Ma) were concentrated in fault zones during regional compression and that the ore minerals were precipitated during hydraulic fracturing of host rocks. Subsequent fault activity pulverized some pre-existing sulphide material into cataclastic grains.

Fu et al. (2017–in this issue) identify two episodes of mineralization in the Mengya'a Pb–Zn–(Ag) deposit in the Lhasa block. Two different types of Pb–Zn–(Ag) mineralization (skarn and porphyry-like styles) have been identified in the Mengya'a mining district. ^{40}Ar/^{39}Ar dating of muscovite suggested that the skarn orebodies formed at 54.8 ± 0.4 Ma, whereas zircon U–Pb dating of granite porphyry (13.2 ± 0.2 Ma) indicated that the porphyry-like mineralization formed in the Miocene.

Ma et al. (2017–in this issue) propose a model for the Lietinggang–Leqingla Pb–Zn–Fe–Cu–Mo skarn deposit in Gangdese polymetallic belt via mineralogical study. The Fe–Cu–Mo mineralization within the garnet-rich zone formed by the interaction between magmatic fluids and the carbonate under oxidizing and higher temperature conditions in early Cenozoic. The Pb–Zn–Cu mineralization within the hedenbergite and ferroactinolite-rich zone formed as the magmatic fluids migrated and reacted with carbonate under reducing and lower temperature conditions.

Chen et al. (2017a–in this issue) investigate the genesis of the Hetaoping Zn–Pb deposit formed in ca.116 Ma, Baoshan block. Fluid inclusion study revealed that the ore–forming fluid evolved from high-moderate temperature (255–498°C) and low-moderate salinity (5.0–18.0 wt.% NaCl equiv) in pre-ore stage, through moderate-low temperature (152–325 °C) and low salinity (0.4–14.2 wt.% NaCl equiv) in syn-ore stage, to low temperature and low salinity in post-ore stage. Fluid mixing process between the magmatic hydrothermal and meteoric water was considered to be a key factor controlling ore precipitation.

Deng et al. (2017a–in this issue) focus on the genesis of the Cangyuan Pb–Zn–Ag polymetallic deposit which formed in ca. 40 Ma. Ore-forming fluids were CO_2-bearing, NaCl–H_2O, which evolved from high temperatures and high salinities (462–498°C, 54.5–58.4 wt.% NaCl equiv) in the skarn stage into mesothermal and low salinities in the sulfide stage (260–397°C, 1.2–9.5 wt.% NaCl equiv). The composition of stable isotope (H, O, S, Pb) suggested that the ore material sourced from the Cenozoic granites.