Mao, J., et al., 2021, Recognition of a Middle–Late Jurassic arc-related porphyry copper belt along the southeast China coast: Geological characteristics and metallogenic implications: Geology, v. 49, https://doi.org/10.1130/G48615.1

Supplemental Material

Major Characteristics of the Ore Deposits

The Yangchun basin of western Guangdong province (WGD), located in the southwesternmost belt, developed among a group of NE– and NEN–trending transpressive faults. Within the basin the stratigraphic sequence consists of Upper Devonian clastic and carbonate rocks. The Jurassic polymetallic Cu deposits are genetically associated with granodiorite, granodiorite porphyry and monzogranite dated at 170–160 Ma with LA–ICP–MS and SIMS zircon U–Pb methods (Li et al., 2000；Huang et al., 2013; Zheng et al., 2015；Ouyang et al., 2019). The Qiguling, Potoumian, Chadi, Mange'ling and Didougang polymetallic Cu skarn deposits occur at the contact between the Jurassic granodiorite plutons and Upper Devonian carbonate rocks. Zheng et al. (2018a, b) obtained molybdenite Re–Os ages of 163.3 ± 1.1 Ma and 164.5 ± 0.9 Ma for the Potoumian and Qiguling deposits, respectively.

In the eastern Guangdong province (EGD), tectonically located east to the Zhenghe–Dapu regional fault, granitic rocks are extensively developed, mainly of Late Jurassic, and some Triassic and Cretaceous age. The exposed strata in the area, comprising lower Jurassic siltstone, and upper Jurassic dacitic and rhyolitic rocks with ages of 165–161 Ma (Wang, 2015; Liu et al., 2018; Jia et al., 2020), are distributed in a series of basins along a group of NE–striking transpressive faults. Several porphyry Cu deposits, comprising the Zhongqiuyang porphyry Cu, E'di Cu, Guantian Cu, Xinliaodong Cu–Mo, and Honggoushan Cu–Au deposits (Fig. 1) occur close to Late Jurassic volcanic basins. They are genetically associated with quartz diorite and granodiorite porphyry with an age range of 170-155 Ma, and hosted by Lower Jurassic siltstone and Upper Jurassic volcanic rocks as well as granitic plutons. Wang et al. (2017) obtained a zircon U-Pb age of 160.1 Ma for the quartz diorite associated with the Xiliaodong Cu deposit. Liu et al. (2018) presented zircon U-Pb ages of 169.4 Ma and 155.6 Ma for the ore-related granodiorite porphyry from the E'di and Honggoushan Cu-Au deposits, respectively. Jia et al. (2019) reported a zircon U-Pb age of 161.7 Ma for the ore-related granodiorite porphyry from the Zhongqiuyang Cu deposit area.

The Gutian porphyry Cu–Mo deposit (Fig. 1) is located at the southwestern margin of the intersection of the Gutian–Baisha NE–trending fault and the Ninghua–Anxi NW–trending fault, east and close to the Zhenghe–Dapu regional fault. The porphyry Cu-Mo deposit is related to a magmatic complex with an outcrop area of 20 km^2, comprising early granodiorite, granodiorite porphyry and late tonalite dikes. The Gutian Cu–Mo deposit is mainly hosted by the granodiorite intrusion and granodiorite porphyry. The orebodies are dominantly characterized by veinlets to stockworks at several millimeters to centimeters in width and minor disseminated ores.

Li et al. (2016) obtained both zircon U–Pb and molybdenite Re–Os ages of ca. 160 Ma for the Gutian granodiorite porphyries and related porphyry Cu–Mo ores, respectively.

Both the Dingjiashan and Fengyan Pb–Zn–Cu deposits (Fig. 1) are located at the margin of the "metamorphic basement window" of the Mid–Late Proterozoic Mamianshan Group, surrounded by Jurassic volcanic rocks. Proterozoic Mamianshan Group is a suite of high greenschist to low amphibolite facies of volcano–sedimentary rocks with granulite, marble and schist units (Feng et al., 2008), covered by Upper Jurassic tuffaceous sandy conglomerate, feldspar quartz sandstone intercalated with fine sandstone, siliceous siltstone, sandy mudstone. There are extensive Cretaceous volcanic rocks outside of the uplift. The dominant Pb–Zn–Cu orebodies are mainly hosted by skarn developed along the Proterozoic carbonate rock layers intercalated with quartz mica schist, and minor in Upper Jurassic volcanic rocks along fractures. Mineralization shows a zoning from buried granite porphyry type Mo, layer–like Cu–Pb–Zn to Pb–Zn upward. The zircon U–Pb ages of the porphyry associated with the porphyry Mo ores are dated at 158 – 155 Ma (Xiao et al., 2019, 2020).

The northernmost part of the ore belt hosts porphyry–skarn polymetallic Cu systems with an age range of 171 – 153 Ma in northeast Jiangxi and western Zhejiang provinces (NEJWZ), geologically located between the Qinhang and Zhenghe–Dapu regional faults (Fig. 1). There are also Jurassic volcanic rocks, which are only seen as remnants on the Precambrian basement in the Lede basin, where the Dexing porphyry Cu–Au–Mo cluster comprising Tongchang Cu–Au, Zhushahong Cu–Mo, Fujiawu Cu–Mo and Yinshan porphyry Cu–epithermal Ag–Pb–Zn deposits occur, genetically associated with 170 Ma granodiorites (Zhu et al., 1983; Li and Sasaki, 2007; Li et al., 2013). Mao et al. (2011) proposed that the porphyry Cu–Au–Mo, epithermal Ag–Pb–Zn and lode Au as well as shear zone hosted Au in the distal contact could be one ore system. Due to strong erosion there are no Jurassic volcanic rocks preserved in the mine areas of the Dongxiang, Yongping, Longtougang, Tongcun and Linghou deposits. The Yongping and Longtougang skarn Cu–Mo deposits formed in Carboniferous limestone and dolomite around 164–152 Ma porphyritic granite and granite porphyry (Wu et al., 2015; Zhu et al., 2016), whereas hydrothermal vein type Cu ores in the Dongxiang mine formed along a group of NE–trending faults in the Upper–Lower Carboniferous quartz sandstone, sandstone, shale and conglomerate intruded by 160.5 Ma granodiorite dikes (Cai et al., 2016). The host rocks for the 168–156 Ma granite porphyries (Qiu et al., 2011) are Cambrian to Ordovician clastic rocks and Carboniferous dolomite in the Tongcun Mo–Cu mine area it formed skarn deposit whereas the host rocks for the 160.6 Ma granodiorite and granite porphyry are Upper Carboniferous dolomite in the Linghou (or Jiande) Cu mine it also formed the magnesian skarn deposit (Tang et al., 2017b).

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FIGURE CAPTIONS

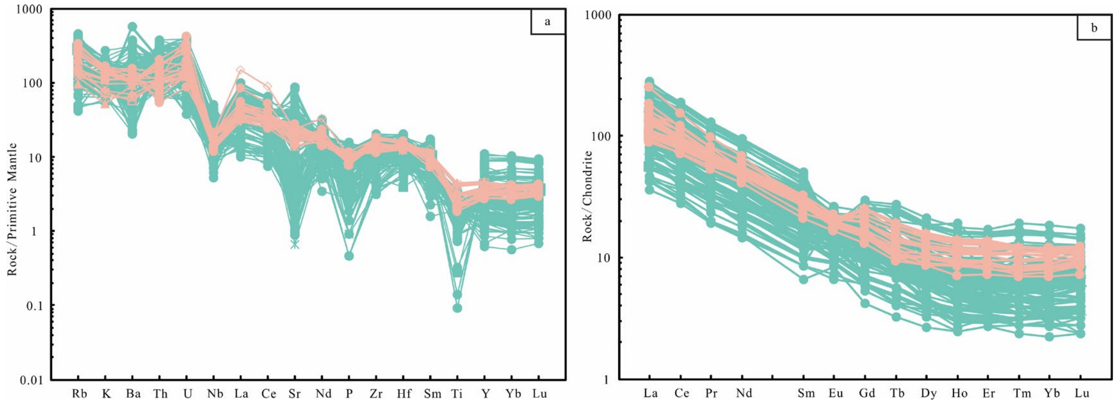

Figure DR1 Chondrite–normalized REE patterns (after Boynton, 1984) and primitive–mantle–normalized spider diagrams (after Sun and McDonough, 1989) for ore–bearing porphyries from the porphyry Cu deposits of the Southeast China coastal belt.

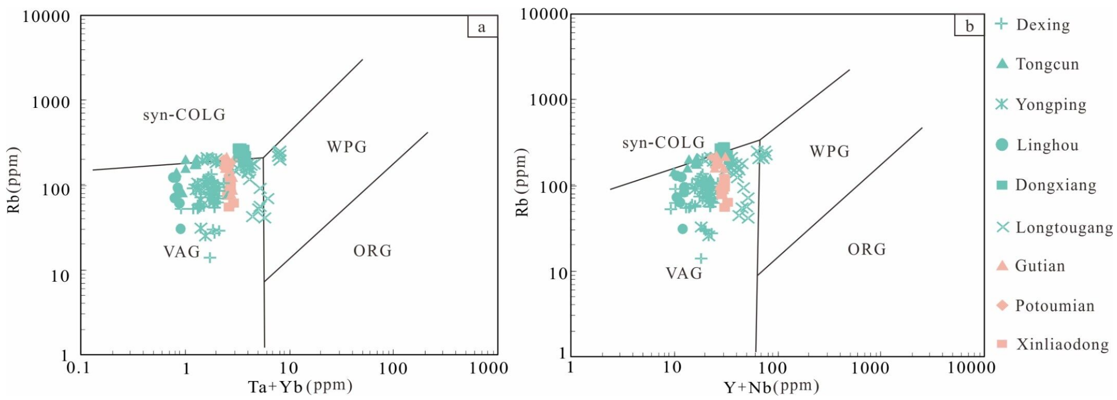

Figure DR2 Tectonic discrimination diagrams of (Ta+Yb)–Rb (a) and (Y+Nb)–Rb (b) (after Pearce et al., 1984) for ore–bearing porphyries from the porphyry–skarn Cu–polymetallic deposits. ORG=ocean ridge granite; VAG=volcanic–arc granite; syn–COLG=syn–collisional granite and WPG=within–plate granites. Note that post–collisional granites plot around the COLG–VAG–WPG triple point.

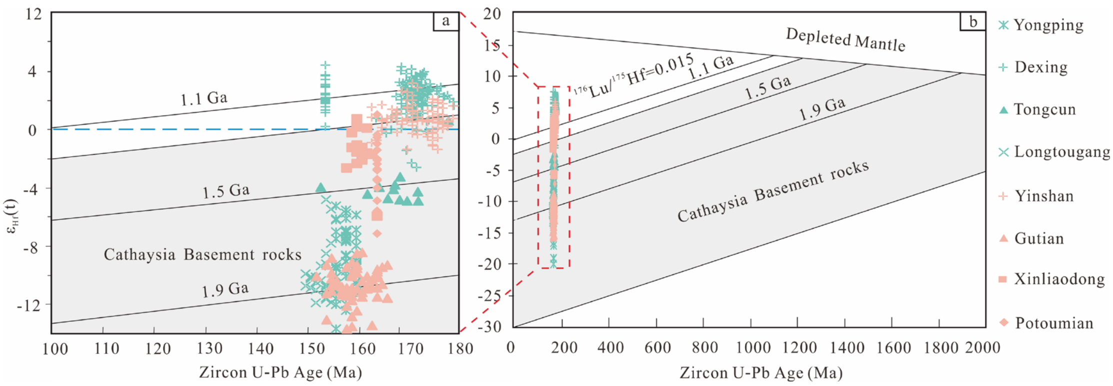

Figure DR3 Plot of $\varepsilon_{Hf}(t)$ versus U–Pb ages of zircons for ore–bearing porphyries from the porphyry–skarn Cu–polymetallic deposits. Cathaysia crustal basement data are from Xu et al. (2007) and He et al. (2010).

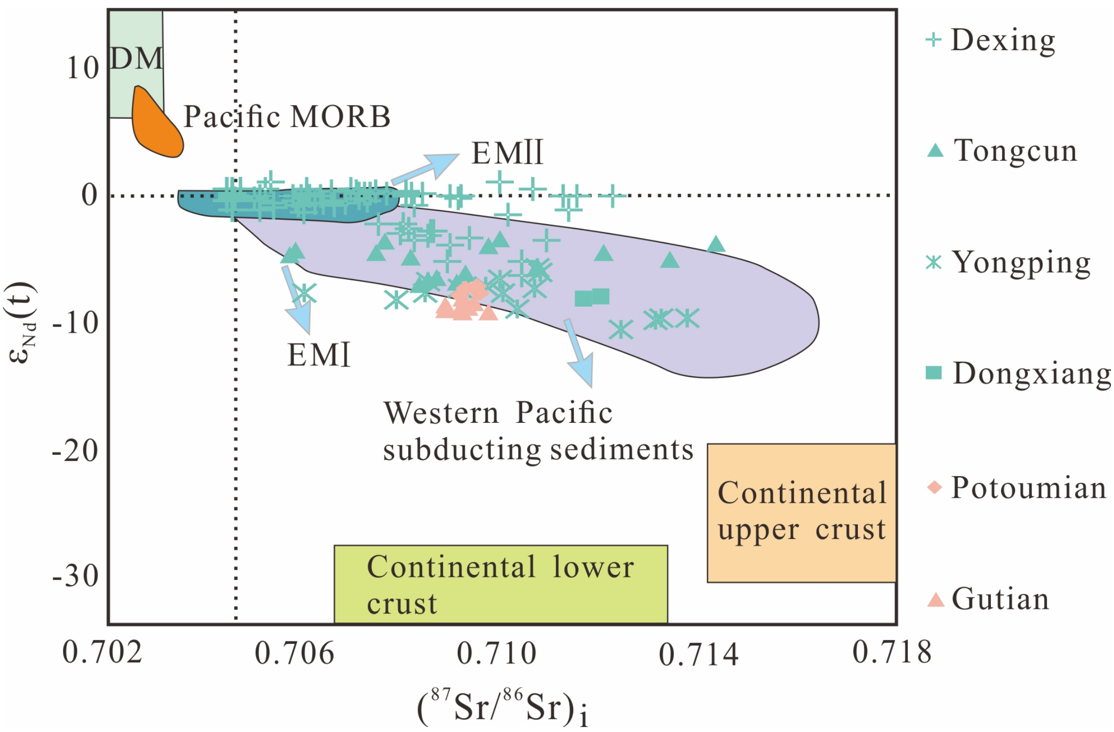

Figure DR4 Diagrams of $(^{87}Sr/^{86}Sr)_i$ versus $\varepsilon_{Nd}(t)$ for ore–bearing porphyries from the porphyry–skarn Cu–polymetallic deposits. Western Pacific subducting sediments are from Plank and Langmuir (1998); Pacific MORB from Vervoort et al. (2000), and DM from Barry et al. (2003).

TABLE CAPTIONS

Table DR1 The major characteristics of the porphyry, skarn and hydrothermal vein polymetallic copper deposits in the Southeast China coastal belt.