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Early Cambrian black shales along the margin of the Yangtze Platform and associated mineralization, South China

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In South China, two extensive organic carbon-, and metal-rich black shale belts are exposed along the southern and northern margin of the Yangtze Platform. Black shales of both belts not only formed during the Early Cambrian, but also have similar lithology, paleogeographic background, and mineralization assemblages. The black shale sequences are enriched in a broad spectrum of redox-sensitive metals, i.e., Mo, Ni, Cr, V, PGE, Au, and U, typical of black shales in general. The southern belt locally hosts polymetallic Ni-Mo-PGE-Au sulfide-rich units, phosphorite, vanadium, barite and stone coal (combustible black shale), whereas the northern belt mainly has Mo-V, phosphorite, barite, stone coal, and silver mineralization. During the Early Cambrian, the southern marginal sea of the Yangtze Platform developed an integrated sedimentary system with a continental shelf lagoon in the middle and a carbonate platform to the northwest and deep-sea basin to the southeast. In contrast, the northern margin of the Yangtze Platform only developed a narrow shelf continental margin due to the collision of the Yangtze Platform and the North China Craton since ca. 800 Ma. Previous studies have indicated that the condensed black shale sequence with extreme Ni-Mo enrichment in the southern margin of the Yangtze Platform formed in restricted euxinic basins, whereas the geographically more widespread V-rich black shale may have formed under open suboxic conditions. Phosphorite is more widely distributed than the polymetallic Ni-Mo sulfide and V mineralization around the margin of the Yangtze carbonate platform. The upwelling of nutrient-rich waters from the shallow open shelf ocean likely resulted in high bioproductivity in the photic zone and led to phosphorus scavenging. With respect to the Ba mineralization, the southern margin of the Yangtze Platform only is dominated by barite, whereas both barite and witherite occur in the northern margin with clear zonation. There, the restricted marginal basin with limited connection to the open sea during the Early Cambrian was favorable for Ba mineralization and CO_2- and CH_4-rich cold-seep venting may be responsible for the formation of witherite. Overall, we infer that variable redox conditions of the sedimentary basin in the southern margin of the Yangtze Platform played a key role for the unique diversification of mineralization in this area. Although the Early Cambrian black shale in the northern margin is not as widespread as in the southern margin, the highly similar mineralization assemblage of both belts suggests that there may have been similar environmental redox conditions and mineralization processes. However, very limited work has been done on the paleo-seawater conditions of the southern margin of the Yangtze Platform and their relationship with mineralization. More work on both belts will be helpful to better understand the Early Cambrian seawater geochemistry and associated mineralization at the margin of the Yangtze Platform, which will also allow the comparison of the Yangtze Platform with similar localities worldwide.