Late Cretaceous (~80 Ma) magmatic-hydrothermal event associated with Sn polymetallic mineralization in the Nanling Range, South China

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The Nanling Range of South China is the most important W–Sn mineralization belt in the world. Mesozoic W–Sn mineralization in the Nanling Range dominantly occurs during the Late Jurassic (160–150 Ma). However, based on our detailed field investigation and zircon studies, a Late Cretaceous (~80 Ma) magmatic-hydrothermal event has been differentiated from the Jurassic main mineralization stage in some typical Sn polymetallic deposits such as the Xianghualing and Xitian. Zircon internal textures, trace element contents and Hf isotopic compositions indicate that the Cretaceous zircons are late stage hydrothermal zircons. They may have crystalized from a late fluid medium generated from deep Cretaceous magmatism which is not visible at shallow depths in the region. The Cretaceous zircons are small, euhedral prismatic in shape and completely dark in CL images, with abundant disseminated hydrothermal mineral inclusions (HREE phosphates, quartz and thorite). Moreover, the high ΣREE, Y, Nb, Ta, Th and U contents, Nb/Ta, $^{176}Lu/^{177}Hf$ and $^{176}Yb/^{177}Hf$ ratios and low Hf and Ti and Hf/Y ratios in the Cretaceous zircons indicate they crystalized from a more evolved, but lower temperature fluid. We proposed that responding to the Late Cretaceous Sn-dominated metallogenic event in South China, a ~80 Ma magmatic-hydrothermal activity occurred in the Nanling Range. This supplementary mineralization was superimposed on the main Jurassic ore-forming stage, enhancing Sn-polymetallic mineralization in the region. It can be concluded that Cretaceous Sn-dominated mineralization was significantly developed after the Jurassic intensive W–Sn mineralization in South China, not only in the southeastern Yuannan and northwestern Guangxi areas but also in the Nanling Range. The occurrence of the Late Cretaceous Sn metallogenic event identified in the Nanling Range further highlights the importance of systematic studies of the Nanling W–Sn belt.