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Metamorphism and deformation of Laojunshan granitic massif in Southeast Asian

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The Laojunshan massif is located near the southwestern margin of the South China craton, considered commonly as part of the South China Block. The Laojunshan gneissic granite together with Song Chay (in northeastern Vietnam) granitic pluton constitutes a large granite dome. Some researchers have described it as a metamorphic core complex or metamorphic dome. The Laojunshan massif is known that have been affected by various tectonic-magmatic activities. The composition of metamorphic rocks, particularly inherited zircons within plutonic bodies may provide information about components of the deep underlying basement. On the other hand, many polymetallic (Sn-W-Pb-Zn) ore fields, such as the Dulong, Xinzhai and Nanwenhe deposits in SE Yunnan, are distributed within or along margins of the Laojunshan massif. Previous research has focused on these deposits and the related late-stage granites, these deposits is related to the lithospheric compression in south China (170-150 Ma) and its extensional thinning (130-80 Ma). Especially, the late-stage magmatism, U-Pb zircon age of monzolite granite is 87.2-75 Ma, played an important role in form these deposits. However, little attention has been paid to the thermal evolution and exhumation history of Laojunshan massif, especially its deformation-metamorphism (P-T-t-D path), the exhumation mechanism. This study presents a new dataset of the structure, microstructure, cathodoluminescence (CL), EBSD texture, microprobe geochemistry and LA-ICP-MS zircon U-Pb ages. The results indicate that the Laojunshan massif includes three units, the footwall, hanging wall and detachment fault system. The footwall is composed of metamorphic rocks with metamorphism and variable deformation and granitic intrusions. In contrast, the hanging-wall unit has undergone weak metamorphism and deformation only. Mineral textures show that the footwall underwent high penetrative deformation within amphibolite facies conditions, which was successively overprinted by multistage low-temperature deformation and metamorphism. A U-Pb zircon age of amphibolite in the footwall is 441.3±2.2 Ma, indicating that “Caledonian” magmatic intrusions are widespread in this area. These metamorphic rocks show amphibolite facies metamorphism and associated deformation at P=0.63-0.72 GPa and T=624-709 °C. Combined with previous dating results, the peak metamorphic age was at 236-220 Ma and subsequent slow cooling occurred. Furthermore, our new data also indicate that in the late-stage exhumation of the Laojunshan massif was accompanied by paleo-seismic and intense hydrothermal fluid activity, which are also responsible for the formation of polymetallic ore deposits. The Laojunshan likely represents an arc along Paleo-Tethyan ocean margin, which was accreted to the South China Block during Indosinian events.