

Petrogenesis of Mesozoic strongly peraluminous granites in South China: Implication for tectonic domains transform

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Geological background

The number of strongly peraluminous granites (SPGs) is more than 1/3 of total number of all granite bodies in South China. All SPGs from South China bear strongly peraluminous minerals such as muscovite, Al-rich biotite, tourmaline, garnet. 13 representative granite bodies are studied through petrography, geochemistry, Sr-Nd isotope and zircon U-Pb isotopic dating.

Results and discussions

The results show that these granites formed in two stages: late Indosinian (228.0~207.6 Ma, ~T₃) and early Yanshanian (173.0~155.4 Ma, ~J₂₋₃). These SPGs have low CaO/Na₂O ratio and $\epsilon_{Nd}(t)$ (-11.9~-8.9) values, high Al₂O₃ value and Rb/Ba, Rb/Sr ratios, and high TE_{1,3} (1.13~1.34) of REE tetrad effect and Nd(t)_{DM} values of 1.9 Ga~1.7 Ga. The geochemistry of high aluminous minerals show that these SPGs were crystallized from primary peraluminous magmas. We suggest that these Mesozoic SPGs were generated through partial melting of early Proterozoic pelitic metamorphic rocks.

Conclusions

Indosinian SPGs were formed under post-collision extensional tectonic setting which was constrained by Tethyan Tectonic Domain. Whereas the early Yanshanian SPGs were formed under back-arc extensional tectonic setting which was controlled by Pacific Tectonic Domain. Therefore, the transform of Tethyan to Pacific Tectonic Domains happened during early Jurassic in South China.

Reference

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SHRIMP zircon U-Pb dating for impure marbles in the Jiaobei terrane of east-central China: Implication for its tectonic affinity

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The application of carbonate Pb-Pb and U-Pb dating has contributed a lot to timing of limestone deposition or marble metamorphism. However, difficulties were encountered in obtaining reasonable isochrons because the U-Pb isotopic system of carbonate rocks is prone to disturb by diagenesis or retrograde alteration. As a result, the carbonate U-Pb or Pb-Pb ages sometimes do not provide a definite dating with the geological meaning. SIMS zircon U-Pb dating coupled with CL imaging is proven to be a successful way to date the impure marble for its ages of both protolith deposition and metamorphism. This is illustrated for impure marbles from the western part of Shangdong Peninsula (i.e. the Jiaobei terrane) in east-central China.

SHRIMP zircon U-Pb dating and CL imaging for two samples of impure marble from the Fenzishan Group in the Jiaobei terrane yield consistent ages of 786±67 Ma and 240±44 Ma for igneous and metamorphic zircons, respectively. Both detrital and metamorphic zircons are identified in the samples of interest. Oxygen isotope fractionation between calcite and garnet from one sample gave a temperature of 680°C, pointing to upper amphibolite-facies metamorphic conditions. Positive $\delta^{13}C$ values as high as +5.6‰ are measured for both pure and impure marbles, consistent not only with the worldwide Neoproterozoic limestones in connection with the global glaciation, but also with the marbles associated with UHP metamorphic eclogites in the Dabie orogen. These results indicate that protolith of the marbles is a kind of limestone that was synchronously deposited with volcanoclastic rocks in the mid-Neoproterozoic rift basin of continental margin. Like the UHP metamorphic rocks in the Dabie-Sulu orogenic belt, both mid-Neoproterozoic magmatism and Triassic metamorphism occurred in the hotly debated region. Therefore, the Jiaobei terrane belongs to the South China Block, corresponding to the seaward flank of rift shoulders during the mid-Neoproterozoic rift magmatism along the continental edge of the South China Block.