

Petrogenesis of the Late Permian intermediate rocks in northern Youjiang Paleo-Tethys Basin of the South China plate: Constraints from chronology and petro-geochemistry

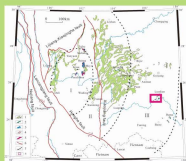
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Youjiang Basin in South China Plate belongs to a branch of Ailaoshan Paleo-Tethys Ocean. The southern rim of Youjiang Basin represents an active continental margin in North Vietnam, while the northern part belongs to Yangtze passive continental margin. Diabase sills of the Late Permian centrally outcrop in Luodian area, Guizhou province in the north of the basin. In recent years, the author found many intermediate dike rocks in the sills. Whether the genesis of these intermediate rocks is related to Youjiang Paleo-Tethys ocean plate subduction to North Vietnam block gained attention.

By field observation and sampling analysis, these intermediate dike rocks intrude into diabase sills. There are mainly two rock types, monzodiorite and quartz diorite. The LA-ICP-MS zircon U-Pb dating result is between 255.6Ma~255.2Ma. The diagenetic time is consistent with circumjacent diabase (255 Ma), the Bama diabase of Guangxi Province (255.3 Ma~257.6 Ma) and main eruption period of Emeishan basalts (257.3 Ma). The intermediate rocks are characterized by high silicon ($\text{SiO}_2=67.20\% \sim 68.60\%$), high titanium ($\text{TiO}_2=0.49\% \sim 0.68\%$) and low aluminum ($\text{Al}_2\text{O}_3=13.65\% \sim 15.15\%$). Most of the samples are rich in alkali ($\text{Na}_2\text{O}+\text{K}_2\text{O}=7.65\% \sim 8.99\%$). The A/CNK value changes between 0.54 and 0.97, and A/NK value changes in the range of 1.16~6.65. The rocks have enrichment of large ion lithophile elements as Ba, Th, U, K and LREE, depletion of high field strength elements as Nb, P, Ti and large ion lithophile element Sr. 10000×Ga/Al values changing between 2.16~4.91 reveal that the mantle source and geochemical characteristics of A_1 type granite belong to nonorogenic rift valley environment within continental plate.

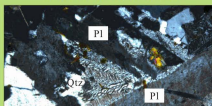
These intermediate dike rocks are located in the outer zone of Emeishan Large Igneous Province, which are products of crystallization differentiation from basic magma in situ. Nevertheless, intermediate rocks of the Late Permian in the inner zone and the middle zone of Emeishan Large Igneous Province are products of allopatric crystallization differentiation. Therefore, intermediate rock of Late Permian in the north of Youjiang Basin is the only example of crystallization differentiation in situ in Emeishan Large Igneous Province. They are formed in the process of mantle plume activity and have no concern with the evolution of the Paleo-Tethys Ocean.



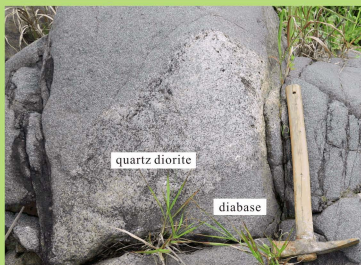
Regional distribution and tectonic features of the Emeishan large igneous province



Intermediate-acid dike



Graphic structure of the quartz diorite (Perpendicular polarized light)



Intermediate-acid pocket