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Emplacement mechanism of the Middle-Late Jurassic Qitianling pluton and its implications on the Mesozoic tectonics and geodynamics of the South China Block

Liu H.[1, 2], Chen Y.[2], Faure M.[2], Scaillet B.[2], Wang B. [1], Huang F.[1, 2], Zhu J.[1], Wang R.[1], Erdmann S.[1]

[1.] State Key Laboratory for Mineral Deposits Research, School of Earth Sciences and Engineering, Nanjing University, Nanjing 210093, China.
[2.] Institut des Sciences de la Terre d'Orléans, UMR 7327, Université d'Orléans, France.

The widespread Mesozoic magmatism that extends about 1500km along the NE-SW strike and 800km wide in the southeastern part of the South China Block is a remarkable feature that has attracted the attention of geoscientists since 1940's. Numerous studies have been carried out, and consequently, several geodynamic models related to the emplacement mechanism have been proposed, based essentially on petrology, geochronology, and (isotopic) geochemistry. Recently, a general consensus apparently is achieved within the geosciences community on the tectonic contexts for the Triassic (compressive) and Cretaceous (extensive) periods, however the tectonic setting of the Jurassic plutons is still in debate, moreover the Jurassic magmatism is closely related to abundant mineralization of rare metal elements. Due to the similarities in age, rock type and major geochemical feature of Jurassic granite, the Qitianling granitic pluton, situated in the Nanling area and dated at ca. 157 Ma, was chosen as the target of this study among 41 visited plutons. Previous studies divide the Qitianling pluton into three petrographic facies, namely: i) Bt + Qtz + Fsd + Amp, ii) Bt + Qtz + Fsd, iii) Bt + Qtz + Fsd. Zircon U-Pb dating indicate the age peak of these different facies at 161Ma, 157-156Ma and 149Ma, respectively. The field observation shows that: 1) the granite is isotropic without visible preferred mineral orientation or deformation; 2) the contact between the granite and country rocks is sharp, with a 1-10m narrow thermal aureole, but without any visible deformation. The microscopic observation of the thin sections confirms the field observation The microscopic observation on the thin sections of wall rocks and granite doesn't show any mineral preferred orientation consisting to the field observation. Furthermore, a total of 53 sampling sites and 318 oriented cores were collected from the Qitianling pluton for an Anisotropy of Magnetic Susceptibility (AMS) study. The investigation on rock magnetism shows the pseudo-single-domain magnetite as the principal carrier of magnetic susceptibility. The degree of magnetic anisotropy (P_J) of all measured samples is lower than 1.12, suggesting that the granites did not experience a post-solidus deformation. Positive values and concentric poles are revealed for the majority of shape parameter (T) and magnetic foliation (k_3), respectively, while the magnetic lineations (k_3) are dispersed. The gravity data of the Qitianling pluton exhibits a laccolite shape with a northeastward trend and a root at its southern central part. Both field observation and laboratory analysis suggests an "atectonic" or weak deformation environment for the emplacement of the Qitianling pluton. Though no existing models of pluton emplacement

(either forceful or permissive) can fully explain the mechanism of its emplacement, our field observation on 41 Jurassic plutons indicate that the internal cause seems more plausible for the widely developed Jurassic plutonism in the South China block.

Keywords: South China Block, Jurassic magmatism, tectonic and geodynamic setting, deformation, Anisotropy of Magnetic Susceptibility (AMS), gravity modeling.