Felsic Intrusion in a Strike-slip Dilational Overstepping Linkage in the Upper Crust: An Example of Palgongsan Granite in SE Korea

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The Palgongsan Granite which intruded into the Cretaceous Gyengsang Basin in SE Korea is elongated in NW-SE direction (ca. 2.4 aspect ratio of long axis to short in exposure) and is generally thought as being emplaced along the WNW-ESE trending Palgongsan Fault which is the boundary between the Uiseong sub-basin (north) and Miryang sub-basin (south) within the basin.

It is widely believed that emplacement of the pluton along the sub-basin boundary removed all evidence associated with the faulting. Recent studies of gravity and aeromagnetic anomalies in the vicinity of the granite imply that the emplacement of this pluton was controlled by the geometry of WNW-ESE trending right-lateral overstepping lineaments. It gives us an opportunity to examine the controlling factors for emplacement such as the internal structural characteristics of the pluton, thermal cooling history, residual magmatic fluid overpressure, and external regional stress regime.

Within the granite, pegmatitic dykes and hydrothermal deposits related to the late stages of intrusion are frequently observed and penetrative joints and faults are also well developed. The study of orientation, distribution, relative cross-cutting relationships and kinematics based on the indicators of each structural element coupled with geochronological and geophysical data provides information of the prevailing stress regime at the time of dyke intrusions and the controlling structures, such as strike-slip overstepping and dilational linkage. The results of 3-D mohr-circle analysis for NW-SE trending dykes show they intruded under vertical σ_1 and NE-SW horizontal σ_3 in low differential stress and relatively high residual overpressure of magmatic fluid. This coincided with regional NW-SE horizontal σ_1 and NE-SW horizontal σ_3 direction based on other structural analysis.

Although these results imply the possibility that the pluton was emplaced in a dilational overstep along a WNW-ESE reactivated dextral strike-slip fault, felsic intrusions in the upper crust are not only controlled by pre-existing structures but are also controlled by other factors such as magmatic flow behavior. Therefore further studies such as magnetic anisotropy suspension and seismic exploration are required to fully understand the mode of emplacement of the Palgongsan Granite.