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The difference of fracture density and fluid flow characteristics between footwall and hanging wall of a high angle fault

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Fault, fracture and vein are closely related structures and they are especially important for mineral explorations in mines associated with hydrothermal solution. However, it is not easy to understand the structural characteristics and related fluid flow characteristics. Also, the characteristics of fluid flow are different between footwall and hanging wall. In this study, we analysed fracture and vein densities across a fault to understand the fluid flow characteristics around a fault. For this study, a well-developed normal fault and associated fracture system is selected (Gasa Island), which is located at the end of the southwestern part of the Kwangju-Yeongdong depression zone (bounded by the Kwangju and Sunchang shear zones) in the Korean peninsula. The study area consists of tuffaceous sedimentary rocks and various volcanic rocks related with Bulguk volcanism in the Late Cretaceous.

In the southeastern part of the Gasa Island, epithermal alteration and gold bearing quartz veins related with hydrothermal solutions are developed. NE-trending normal fault system and associated secondary fractures were filled with gold bearing quartz veins. Scanline analysis was carried out across the fault in hanging wall and footwall of the Lighthouse Vein system in Gasa Island to compare the widths of vein and alteration zone.

The gradient change of the cumulative fracture density graph indicates effects of faults. This points are well matched with the gradient change points of the cumulative width of quartz vein. It indicates that the developed quartz vein system is closely related with the characteristics of the associated fault.

Total number of fractures and veins counted on 50m scanline in hanging wall is similar to in footwall. The width of alteration zone in hanging wall takes up to 37.120% of 50m scanline, and the total width of quartz vein takes up to 5.034%. In contrast, the total width of the alteration zone and the vein in footwall occupy 3.493% and 3.008%, respectively. As a result, the fluid flow characteristics associated with this fault system is more effective in in the hanging wall than in the footwall.

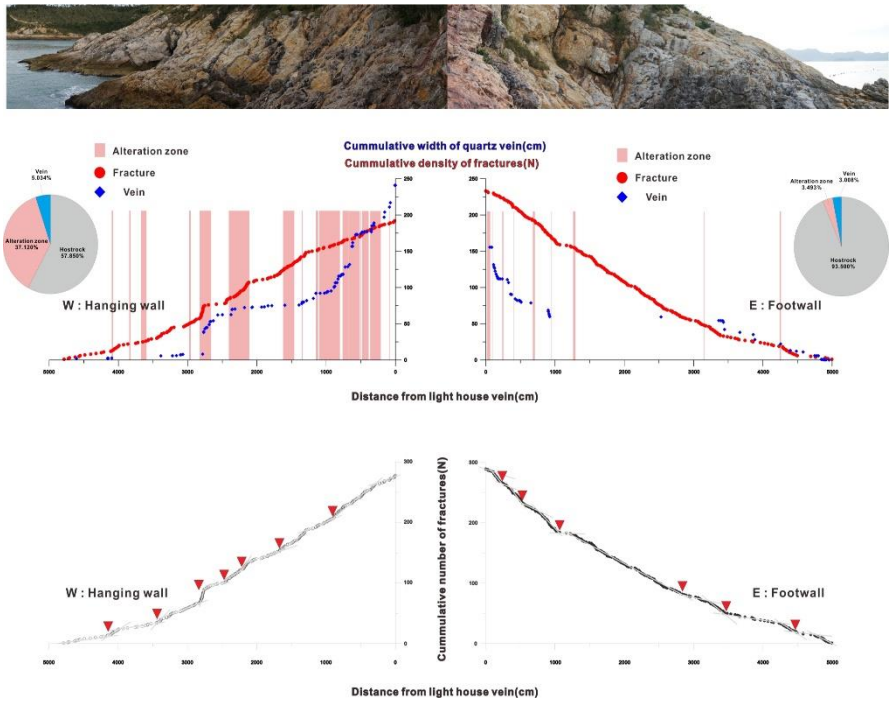

Figure 1: Cumulative number of fracture and quartz vein in the hanging wall/footwall of Lighthouse Vein in the study area. Lighthouse Vein is filled with quartz mineral along normal fault and secondary fractures.