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Pipe-Globule Complex Structures in the Seokpo Tuff on Solseom Island, Buan-gun, Jeollabuk-do, Korea: Discrimination from Gas-Escape/Segregation Structures and a Hydrothermal Interpretation

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This study aims to characterize and interpret the occurrence, microtextures, and mineralogical/geochemical features of a pipe–globule complex (PGC) developed in the lower Seokpo Tuff of the Buan Volcanics, exposed on Solseom Island, Buan-gun, Korea. Field observations show the PGC is concentrated within the bottom 0–20 m of the Seokpo Tuff, forming a -5 m thick clustered horizon that extends less than 20 m laterally. While containing clasts similar to those in the host deposit, it is marked by fewer lithic clasts and more fine ash matrix, creating a clear grain-size contrast with the host. The structures often have sharp boundaries relative to the host, exhibit cross-cutting relationships, and are surrounded by reddish alteration. SEM–EDS analyses reveal that the PGC is dense, cemented, with alkali feldspar films, internal quartz infill textures, and abundant Fe-oxide minerals like magnetite and hematite. X-ray diffraction indicates that both the host and the PGC are mainly quartz, plagioclase, and alkali feldspar; the PGC also contains clay minerals (illite and chlorite) and Fe oxides. XRF analyses indicate the PGC matrix is enriched in SiO_2 and K_2O and depleted in Al_2O_3 compared to the host, implying localized silicate reorganization and cementation. Overall, these findings suggest the Sol Island PGC is a secondary structure formed by post-emplacement hydrothermal processes, involving fluid ascent, fluid–rock interactions (precipitation, replacement, cementation), and localized deformation, rather than a primary gas-escape or segregation feature in ignimbrites. This research emphasizes the importance of combining field observations, microtextures, and mineralogical data to identify the origins of similar structures in ignimbrites.