Occurrence and genetic process of Miocene peperite in the Tanzawa area, South Fossa Magna, central Japan

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Miocene subaqueous volcaniclastic rocks which constitute an oceanic island arc belonging to the paleo-Izu-Bonin arc are widely distributed in the Tanzawa area. We can identify three types of peperite intercalated in these volcanicalstic rocks.

Type A: Fluidal peperite mainly composed of globular andesite clasts, partly containing andesite breccias. The host sediment is lapilli tuff. Clasts are closed packed in the lower part and widely dispersed in the upper part.

Type B: Fluidal peperite mainly composed of globular andesite clasts. The host sediment is tuff breccia. Clasts are not widely dispersed in the host sediment.

Type C: Blocky peperite mainly composed of andesite breccias. The host sediment is volcanic-mud. Andesite clasts are close-packed and often showing jigsaw-fitting.

There are various discussions on the factors that influence morphology and generation of the juvenile clasts. Busby-Spera and White (1987) proposes that coarse grain size, high permeability and poor sorting of the host sediment favor blocky clast development. This idea is not consistent with the facies of A and B type peperites above. Other important elements that influence the type of peperite are viscosity and temperature of the magma. These are conceivable elements that influence the formation and stability of vapor films. When magma intrudes into the host sediments, a low viscosity and high temperature fluidal peperite is formed. On the other hand, blocky peperite will be easily formed in the case where the magma is highly viscous and with low temperature (Squire and Mcphie, 2002). The genetic processes depend on the degree of insulation generated by stable vapour films at the magma-host sediment interface. Peperite C facies suggests a magma origin with low temperature and high viscosity. The jigsaw-fit texture that is seen in peperite C, is widely inferred to reflect in situ quench fragmentation.

It is possible that mingling of juvenile clasts and host sediment is due to forceful intrusion of magma, fluidization of sediment, magma-sediment density contrasts, and/or hydromagmatic explosions etc. The lower part of peperite A, peperite B and peperite C is not dispersed. The mingling of juvenile clasts and host sediment of these peperites will be produced by forced intrusion of magma, fluidization of sediment, and/or magma-sediment density contrasts. The upper part of peperite A is widely dispersed in the host sediment. This peperite is formed by the mingling of juvenile clasts and host sediment which are generated by fluidization of sediment and fluid-fluid shear.

Reference

Busby-spera, C. J., White, J. D. L., 1987, Bull. Volcanol., 49, 765-775.

Squire, R. J., Mcphie, J., 2002, J. Volcanol. Geotherm. Res. 114, 45-61.