

What does occur inside the volcanic edifices with the rift zones?

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Hotspot volcanoes in the Hawaiian and the Canary islands have two or three directions of dominant rift zones, which are highly developed. Rift zone is dike swarms lengthened specific direction (several kilometers). Most of polygenetic volcanoes, however, are frequently observed radial dike swarms. On the other hand, the Galapagos volcanoes, also typical hotspot volcano, don't have rift zones, and radial/ring dike swarms frequently coexist in shield (Chadwick and Howard, 1991).

Walter and Troll (2003) suggested that the general unsteadiness of weak sediment layer may become a major player in shaping a volcano's architecture. In their model, however, it can't be explain that the occurrence of the difference between radial and linear dikes. The most important factors that control the growth of a rift zone, seem to be injection point, direction, volume, and velocity of intruding magma. They are likely to drive a re-distribution of stress field, or by each interaction of them.

In this study, by using a 'gelatin cone' as a simulation of strato-volcano, we made a series of experiments by changing of above indicated parameters. Geometrical parameters of the 'gelatin cone' are 28cm in diameter of bottom plane, 10cm in height. The gelatin cone was placed on a PVC plate with several holes for the injection of fluid. After injecting of colored water and viscous fluid into the cones through the holes, the propagation speed and direction of fractures were observed. The strength of gelatin cone can be controlled by the mixing ratio of gelatin and water, and other factors affecting the rigidity of gelatin include its temperature. Gelatin is characterized by linear viscoelastic behavior at small deformations (Richards and Mark, 1966). The solute gelatin gel has Poisson ratios of nearly 0.4 - 0.8, mixing ratios of 2% - 1.4%.

As to the relationship between fracture distribution and local stress field on injection, we compared the experimental results to a natural variation of development of rift zones, and came to the preliminary conclusions as follows:

- (1) Unstable volcanic edifices by weak substratum don't always control the development of rift zones.
- (2) Stress field inside the volcanic edifices by volcano loading stress and magma intrusion are control the development of rift zones.

In addition, we found that the volcanic edifices with the rift zones are likely to have a horseshoe-like caldera, by sector collapsing. In the future, we will try to test by changing parameters, and discuss the development of rift zones by comparing with the geological evidence.