Dyke emplacement in Tenerife (Canary Islands): Field studies and numerical models *Poster*

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Dykes are magma-driven extension fractures and the main conduits for magma in volcanic eruptions. To understand the mechanics of dyke emplacement is thus essential to assess volcanic hazards. To improve the understanding of the processes of dyke initiation from shallow magma chambers and dyke propagation through a mechanically-layered crust, field measurements and observations from Tenerife (Canary Islands) are used and compared with the results from numerical models.

Careful studies of 550 dykes in three profiles in the Anaga massif (Tenerife) include measurements of dyke geometry and orientation. The results of these measurements show that dykes have been injected from a deep-seated reservoir during the shield-building phase. Furthermore, the dyke attitudes agree with the main axial trends of Tenerife that are preserved in the old massifs of Teno, Anaga, and Roque del Conde. In addition, it has been observed that most studied dykes did not reach the surface to feed volcanic eruptions but became arrested.

Using data from field studies in Tenerife, numerical models on the effects of a mechanically layered crust on the stress fields around magma chambers of different geometries and around a propagating dyke were made. These models use the finite element program ANSYS and the boundary element program BEASY. The numerical models of the stress field around circular and sill-like magma chambers show that a mechanically layered crust is likely to arrest many dykes injected from a magma chamber. The numerical models indicate that, for the given loading conditions, most dykes either turn into sills at contacts between layers of contrasting mechanical properties or, more likely, become arrested. Stress-field homogenisation is presumably a necessary condition for a dyke to be able to reach the surface to feed a volcanic eruption.

The field studies and numerical models also indicate that the geometry of the tip of an arrested dyke depends much on the mechanical properties of the arresting layer. When a dyke is arrested on meeting a soft layer the dyke tip will be blunt. By contrast, a dyke arrested on meeting a stiff layer will have a rather sharp tip. The numerical models on dyke propagation also show that the main tensile stress concentration can be expected around the dyke tip. Only if the tensile stresses at the dip of a dyke exceeds the tensile strength of the host-rock, has the dyke a chance of propagating to shallower crustal levels or, eventually, to the surface.

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