



Dykes injection and flank failure at Stromboli volcano (Italy): constraints on their relationship from petrochemical and structural data

V. Acocella (1), C. Corazzato (2), L. Francalanci (3), M. Menna (4), **C.M. Petrone** (3), A. Renzulli (4), G. Serri (5), A. Tibaldi (2), L. Vezzoli (6)

(1) Dipartimento di Scienze Geologiche, University of Rome 3, Rome, Italy, (2) Dipartimento di Scienze Geologiche e Geotecnologiche, University of Milan Bicocca, Milan, Italy, (3) Dipartimento di Scienze della Terra, University of Florence, Florence, Italy, (4) Istituto di Vulcanologia e Geochimica, University of Urbino, Urbino, Italy, (5) Dipartimento di Scienze della Terra, University of Parma, Parma, Italy, (6) Dipartimento di Scienze Chimiche e Ambientali, University of Insubria, Italy

Injection of shallow-level intrusions represent a potential hazard for the stability of volcanic flanks. At Stromboli, dyke injections is commonly associated with the persistent magmatic activity and this can represent a serious danger given the high instability of the north-western flank of the volcano ("Sciara del Fuoco"). The 2002-2003 eruptive crisis of Stromboli volcano has drawn attention to the importance of understanding the correlations between magmatic activity and failure of the unstable Sciara del Fuoco. Strike, dip direction, inclination, thickness and petrochemical composition of each dyke were determined. In order to understand possible mutual influence of dyking and failures of the NW flank of the volcano, the different structural and petrological parameters of dykes are related to stratigraphic relationships, geometries and ages of the various sector collapses. In the past 100 ka volcanic activity has been characterised by several collapses alternating with growth phases having different magma composition: calcalkaline (CA), potassic (KS), high-K calcalkaline and shoshonitic (SHO).

After 13 ka BP, dykes were injected along the NE-SW weakness zone which cuts the summit of the volcano and parallel and close to the margins of the earliest sector collapse at dips of 20-80° inclined towards the collapse depression. Dyke composition spans from CA to KS, through SHO series, similarly to the compositions of most of the

Stromboli extrusives. KS dykes are bordering the Sciara scarp, whereas CA dykes are mainly found in the Vallone di Rina, showing the lowest TiO_2 , P_2O_5 and incompatible element contents. The most mafic compositions belong to the SHO series, with lower Ba, Rb and Pb contents in respect with KS at similar silica contents.

Our results indicate that despite the structural stability of the feeding system in last 13 ka, a major variability in the chemical and isotopic composition of the dyke population was found. Chemical and isotopic variations of the outpoured magmas and/or structural variation in the geometry of the volcano or in its plumbing system can be invoked as causes of collapses.