Reconstructing the magmatic conditions driving eruptions at Mt. Etna

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The recent activity of Mount Etna can be explained envisaging that eruptions are triggered by magma mixing or by decompression of shallow (6-4 km b.s.l.) magma batches. In such a type of feeding system, characterized by the absence of a persistent magma chamber, mixing occurs between magmas with very similar geochemical features but that underwent to different fractionation histories, constrained by the intensive physical parameters of the magmatic system.

In this contribution, we face up different aspects of the crystallization history of Etnean magmas from the mantle source to the surface, focusing on textural and compositional variations of clinopyroxene and plagioclase as a tool to record changes in the physical and chemical parameters of the magmatic system.

We estimated the T, P, fO_2 and H_2O content of Etnean magmas using several crystal-melt partitioning equations. These data were used to reconstruct the primitive features of mantle equilibrated magmas and the stability field of clinopyroxene and plagioclase. Both textural and compositional features of plagioclase and clinopyroxene were then used as archive of chemo-physical changes in the Etnean plumbing system for interpreting a variety of magmatic processes such as magma mixing, input or loss of volatiles, polybaric crystallization and the ascent rate of magma.