



## **Making geochemical data representation simple: pattern classification applied to products of Mt Etna volcano**

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We apply a pattern classification method based on Kohonen maps and fuzzy clustering to geochemical analyses of volcanic products erupted by Mt Etna during lava flows, Strombolian and lava-fountain activity. Two data sets are considered: the first one refers to volcanic products collected at Mt. Etna from 1995 to 2005; the second data set covers the time span from 2006 to 2012 during which important volcanic unrests (in 2006 and 2007-08) and 25 lava fountains (in 2011-12) occurred. For each sample, 13 major and trace elements are considered. The classifier provides an efficient identification of groups of volcanic products with similar geochemical composition. The potential benefits of the method for the visualization of multi-component characteristics of magma are presented. Unlike the many low-dimensional diagrams (78 possible combinations in conventional 2D graphs) required by classical analyses, our method offers the graphical visualization of the results in just a single picture, using a convenient color code. In addition, this graphical visualization allows us the rapid identification of the compositional features of each sample and their comparison with all products analyzed in the 16-year-long time span. This simplified representation of the multivariate data is extremely useful to investigate on the development of geochemical properties of the erupted material in time.

Using pattern classification on geochemical data collected at Etna from 1995-2005, Corsaro et al. (2013) highlight links between eruptive centers, which deliver a reliable picture of a multifaceted plumbing system in agreement with geochemical and geophysical evidence reported in the literature. Applying the classification method to the data collected from 2006 on, we analyze how the most recent eruptive products are related to this picture, investigating on time developments as well as similarities to data groups identified in the previous decade.