



## **An innovative tool to recognize changes in the volcanic state at Mt. Etna**

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A volcano is a complex system, whose hidden workings can give deepened details about its internal dynamics. We propose the innovative K-Contractive Map method for a novel classification analysis at Mt. Etna volcano. The method relies on the Auto-CM technique, which fully estimated weights among the analyzed data. The reference dataset of monitoring data includes 28 variables and 1581 records, collected in the January 2001 – April 2005 time period, during which three flank eruptions occurred (for a total of 301 eruptive days). By associating with changes in the volcano activity target, we estimated a sensitivity higher than 95% and a specificity close to 100%, with an accuracy higher than 98%. Even if the flank eruption occurring in September 2004 – March 2005 was not predicted by any anomalous parameter, relative days were classified as eruptive. No eruptive days classified as error are interpreted as false positive because of the presence of anomalies in monitored parameters.