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Relationship between eruptive parameters and seismic and infrasonic signals during Etna lava fountains

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Deriving eruptive parameters (i.e. mass eruption rate, column height) from geophysical data is a fascinating and challenging task. Many previous works have attempted to quantitatively derive magma discharge and/or plume height from seismic, infrasonic signals and ground deformation data. However, it has been highlighted that to date there are great uncertainties in the estimation of eruptive parameters based only on seismic and infrasonic data, due to the lack of simultaneous seismic-acoustic and volcanological observations, as well as to the strong assumptions which the proposed models are based on. In this work, we empirically explored the relationship between seismo-acoustic signals and eruptive parameters measured during some explosive episodes produced by the New South-East Crater of Mt. Etna, in Italy. In particular, we compared the time series of plume and lava fountain heights with seismic and acoustic energies calculated for different phases of each eruptive episode. The relationship and correlation coefficients helped us characterizing lava fountain episodes and identifying their different behaviour in terms of evolution of eruptive activity. The results of this study provide further insights to understand how eruptive parameters may be obtained by seismic and acoustic signals.