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A review of source processes and magma-gas transport mechanism at Stromboli volcano, Italy

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The volcanic tremor and explosion quake time series recorded by seismic antennas, a broadband three-component seismic network installed at Stromboli volcano during 1992 and 1997, and by two strainmeters installed in 2006 have been used to infer the source processes acting on such a volcano. By using decomposition methods in both frequency and time domains, it has been evidenced that the volcanic tremor can be described as a linear combination of nonlinear signals in time domain. These "components" are similar to those obtained for explosion-quakes, with the differences only for their amplitude enhancement. These nonlinear signals have been characterized both in terms of their wavefield properties as well as dynamic systems, by taking into account the complex processes of magma flow and turbulent degassing. The distribution of tremor amplitudes is Gaussian while the inter-times between the maxima in a suitable scale are described by a clustered Poisson process. The diffusive coalescence model firstly introduced by Chandrasekar has been applied to derive the basic source parameters of the bubble system. A gas fraction exsolved in the magma, with particle sizes of the order of a mm plays a relevant role in the activity of Mt. Stromboli. Observed volcanic tremor and the explosion quakes agree with such a model, following a diffusive kinematic law and a coalescence process.