Geophysical Research Abstracts, Vol. 7, 02384, 2005
SRef-ID: 1607-7962/gra/EGU05-A-02384

Analysis of the time of inter-arrives of the Strombolian explosions.

M. Bottiglieri(1), E. De Lauro (2) , S. De Martino(2), M. Falanga (2), C. Godano(1) e M. Palo(2)

(1) Environmental Science Department, II University of Naples, Italy; (2)Physic Department, University of Salerno,Italy; (milena.bottiglieri@unina2.it)

The studied signals have been extracted from seismic signals recorded at Stromboli volcano during the experiment made on September 1997. The aim of this paper is to analyze the distribution of the inter-arrive times of the explosions to get information about bubbles' (slug) distribution and about their mechanism of generation. We start considering the explosion quakes corresponding to the bubble explosions at the free surface as during the process of raising in the conduit. The signals have been filtered in the 0.02-0.5 Hz frequency band to show the waveform VLP, i.e. explosions envelope, previously relieved and analyzed by Chouet, (Chouet et al., 1999, 2003). As first step, to compute the inter-arrive times, we have selected from the data sets the VLP events, using the standard STA/LTA technique. Our data set so consists of: ů 2 windows of 7 hours, ů 1 window of 22 hours, ů 1 window of 25 hours. As second step, analysis has been made on the sequence of the explosion inter-times for four different thresholds, so we can established that the characteristic distribution of the signals is typically Poissonian. The estimate of the ratio between the standard deviation and the mean value confirms this result. For all considered cases, the ratio is always resulted to be nearly 0.8, it is worth to say that, in the limit of the experimental instruments, it can be approximate to 1 as requested by Poissonian distribution. The explosions' sequence has also been treated with the multifractal analysis, the inter-times have been analyzed for the all different thresholds. The fractal dimension estimated has been always resulted nearly 1. The results obtained by the aforesaid analysis remark the known models on the bubble coalescence. In this paper we assume the bubbles' distribution in the magma camera to be Gaussian and the coalescence as the explosive bubble's generating mechanism. We also assume that the rising process of exploding bubble

along the volcano conduit is simply driven by buoyancy, and we consider constant the rising time. Then we hypothesize a simply diffusive model, Chandresekar Model, by which, being L the characteristic correlation scale, proportional to the bubble size, we can write a cinematic relation. This model, based on the inter-times distribution, gives in order of magnitude, i.e. meters, the characteristic dimension of the bubble size and it forecasts the observed dimensions of the real bubble. It is possible to prospect a future comparison between the dimension distribution ad the energy.

Bibliography Chouet B. A., Saccorotti G., Dawson M., Martini M., Scarpa R., De Luca G., Milana G. e Cattaneo M.; 1999: Broadband measurements of sources of explosions at Stromboli Volcano, Italy. Geophys. Res. Lett., 26, 13, 1937-1940. Chouet B., Dawson P., Ohminato T., Martini M., Saccorotti G., Giudicepietro F., De Luca G., Milana G. e Scarpa R.; 2003: Source mechanism of explosions at Stromboli Volcano, Italy, determinated from moment-tensor inversions of very-long-period data. J. Geo. Res., 108, B1, 2019. Namiki A., Hatakeyama T., Toramaru A., Kurita K. e Sumita I.; 2003: Bubble size distributions in a convecting layer. Geophys. Res. Lett., 30, 15, 1784. Bottiglieri M., De Lauro E.,De Martino S., Falanga M., Godano C., Palo M.: Analysis of the time of inter-arrives of the Strombolian explosions; CNR, GNGTS 23° convegno nazionale Roma 14-16/12/2004. Bottiglieri M., De Lauro E.,De Martino S., Falanga M., Godano C., Palo M.; preprint: Analysis of the time of inter-arrives of the Strombolian explosions.