THE MECHANISM OF GENERATION OF AUTO FLUCTUATIONS AT VOLCANO KARYMSKY EXPLOSIONS

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During separate volcano Karymsky explosions, there is a pulsing emission of an ash - gas mixture from a crater with a duration of several minutes. These explosions are accompanied by acoustic and seismic signals with a precisely expressed periodicity of 0.5-2.0 sec. There are several possible models to explain this phenomenon. In this paper, a new model is considered. It specifies that during the explosions, the conditions for occurrence of auto fluctuations are sometimes created. For an auto oscillatory system, we consider the following elements:

1. Generator of fluctuations - top part of a magma column saturated by gas bubbles;
2. Source of energy - gas contained in bubbles under pressure;
3. Function of an element managing receipt of energy in oscillatory system.
4. The feedback between oscillatory system and managing element, are combined in a wave of rarefaction arising at the pulsing expiration in a gas cavity, located above magma column.

The auto oscillatory process occurs under the following scheme. After destruction of a fuse at the bottom of crater consisting of a previous explosions material and quenched crust of lava, the pressure in a gas cavity falls and the coalescence of gas bubbles process in the top layer of magma column begins. This produces fragmentation of the magma top layer. As a result, the pressure in area of gas liberation sharply grows and upwards in a gas cavity; the wave of compression is can convert into a shock wave. After an exit of a shock wave in the atmosphere downwards on a gas cavity, the wave of rarefaction is distributed which at achievement of gas saturated magma again causes process of merge gas bubbles in the following magma layer, and the cycle repeats. The waves of rarefaction in a gas cavity play a role of external force. The analysis of spectra of acoustic and seismic signals has shown, that the auto fluctuations are synchronized on second overtone of external force.

It is possible to consider this process as a first approximation process in terms of an auto oscillatory system with one degree of freedom, the fluctuations in which are described by the Van der Pol differential equation. It is necessary to note that for work of the offered mechanism the certain magma condition in the top part of the magma channel is necessary which is formed depending on a ratio of such parameters as: speeds of magma rise and its physical properties.

The periodic pulsations of pressure in the top part of magma column cause fluctuations in magma, saturated by gas bubbles, seismic waves, generating in an environment, with frequency determined by the sizes of the generator.