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## Bubble nucleation and growth in basaltic magmas as a possible source of Deep Long Period Volcanic earthquakes

**Nikolai M. Shapiro**<sup>1,2</sup>, Oleg Melnik<sup>3</sup>, Vladimir Lyakhovsky<sup>4</sup>, Natalia Galina<sup>2</sup>, and Olga Bergal-Kuvikas<sup>5</sup>

<sup>1</sup>Institut des Sciences de la Terre, CNRS, Université Grenoble Alpes, Grenoble Cedex 9, France (nikolai.shapiro@univ-grenoble-alpes.fr)

<sup>2</sup>Schmidt Institute of Physics of the Earth, Russian Academy of Sciences, Moscow, Russia

<sup>3</sup>Institute of Mechanics, Moscow State University, 1 Michurinskiy prospekt, 119192 Moscow, Russia

<sup>4</sup>Geological Survey of Israel, Jerusalem, Israel

<sup>5</sup>Institute of Volcanology and Seismology, FEB RAS, Petropavlovsk-Kamchatsky, Russia

Deep Long Period (DLP) earthquakes have been observed in many volcanic regions and are often considered as one of the important precursors to volcanic eruptions. At the same time, the physics of the source of these earthquakes remains unclear. We focus our study on Klyuchevskoy group of volcanoes in Kamchatka, Russia, one of the World's most active volcanic system. The DLP earthquakes in this region occur at the limit between the lower crust and the upper mantle at depths of 30-35 km where ductile flow is expected to dominate rock deformation. Their occurrence also appears to correlate with the eruptive activity. Therefore, this is natural to consider that their generating mechanism is not related to brittle mechanism but rather to pressure fluctuations in the magmatic system as often suggest for the LP seismicity in general. We suggest a possible generating mechanism related to the rapid pressure changes caused by nucleation and growth of gas bubbles in response to the slow decompression of over-saturated magma. The pressure variation is simulated using the mathematical model of bubble nucleation and growth accounting for multiple dissolved volatiles (H<sub>2</sub>O-CO<sub>2</sub>) and diffusive gas transfer from magma into growing bubbles. Results of simulations show that fast pressure increase followed by its relaxation almost to its initial level is not very sensitive to the assumptions on the values of governing parameters. Typical pressure changes of a few tens of MPa in a volume of 3500 m<sup>3</sup> occurring on time scales of fractions of a second to a second following bubble nucleation and growth can generate seismic waves with amplitudes similar to those recorded by seismographs in the vicinity of the Klyuchevskoy volcano.