

## The complex frequencies of long-period seismic events as probes of fluid compositions beneath volcanoes

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Long-period (LP) events characterized by their harmonic signature have been interpreted as oscillations of a fluid-filled resonator. We analyze waveforms of LP events observed at various volcanoes using the Sompi method. The results of our analysis show a wide variety of Q factors, ranging between tens and several hundreds. We compare these complex frequencies with those predicted by the fluid-filled crack model for various mixtures of liquid, gas and solid. Though the oscillations of LP events with Q smaller than 50 can be explained by various combinations of liquids and gases, we find that dusty and misty gases are required to explain long-lasting oscillations with Q larger than 100.