Interpretation and utility of infrasonic records from erupting volcanoes

J. B. Johnson [a], R. C. Aster [b], M. C. Ruiz [c], S. D. Malone [a], P. J. McChesney [a], J. M. Lees [d], P. R. Kyle [b]

[a] Geophysics Program, University of Washington, Seattle, WA, USA
[b] Department of Earth and Environmental Sciences, New Mexico Institute of Mining and Technology, Socorro, USA
[c] Instituto Geofisico, Escuela Politecnica Nacional, Quito, Ecuador
[d] Department of Geological Sciences, University of North Carolina, Chapel Hill, NC, USA

Abstract

In the most basic seismo–acoustic studies at volcanoes, infrasound monitoring enables differentiation between sub-surface seismicity and the seismicity associated with gas release. Under optimal conditions, complicated degassing signals can be understood, relative explosion size can be assessed, and variable seismo–acoustic energy partitioning can be interpreted. The extent to which these points may be investigated depends upon the quality of the infrasonic records (a function of background wind noise, microphone sensitivity, and microphone array geometry) and the type of activity generated by the volcano (frequency of explosions, bandwidth of the signals, and coupling efficiency of the explosion to elastic energy). To illustrate the features, benefits, and limitations of infrasonic recordings at volcanoes, we showcase acoustic and seismic records from five volcanoes characterized by explosive degassing. These five volcanoes (Erebus in Antarctica, Karymsky in Russia, and Sangay, Tungurahua, and Pichincha in Ecuador) were the focus of seismo–acoustic experiments between 1997 and 2000. Each case study provides background information about the volcanic activity, an overview of visual observations during the period of monitoring, and examples of seismo–acoustic data. We discuss the benefits and utility of the infrasound study at each respective volcano. Finally, we compare the infrasound records and eruptive activity from these volcanoes with other volcanoes that have been the focus of previous seismo–acoustic experiments.

Available in:

Journal of Volcanology and Geothermal Research, 2007, vol. 121, no 1-2, p. 15-63.

DOI: https://doi.org/10.1016/S0377-0273(02)00409-2

http://www.sciencedirect.com/science/article/pii/S0377027302004092