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Atmospheric influence on volcano-acoustic signals

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Volcanoes are natural sources of infrasound, useful for studying infrasonic propagation in the atmosphere. Large, explosive volcanic eruptions typically produce signals that can be recorded at ranges of hundreds of kilometers propagating in atmospheric waveguides. In addition, sustained volcanic eruptions can produce smaller-amplitude repetitive signals recordable at >10 km range. These include repetitive impulsive signals and continuous tremor signals. The source functions of these signals can remain relatively invariant over timescales of weeks to months. Observed signal fluctuations from such persistent sources at an infrasound recording station may therefore be attributed to dynamic atmospheric propagation effects. We present examples of repetitive and sustained volcano infrasound sources at Mount St. Helens, Washington and Kilauea Volcano, Hawaii, USA. The data recorded at >10 km range show evidence of propagation effects induced by tropospheric variability at the mesoscale and microscale. Ray tracing and finite-difference simulations of the infrasound propagation produce qualitatively consistent results. However, the finite-difference simulations indicate that low-frequency effects such as diffraction, and scattering from topography may be important factors for infrasonic propagation at this scale.