

Waveform Inversion and Mass Flux Validation from Sakurajima Volcano, Japan

Recent advances in numerical wave propagation modeling and station coverage has permitted robust inversion of infrasound data from volcanic explosions. Complex topography and crater morphology has been shown to substantially affect the infrasound waveform, suggesting homogeneous acoustic propagation assumptions are invalid. Volume flux estimates from the infrasound waveform inversion provide an exciting tool for accurate characterization of both volcanic and non-volcanic explosions. Mass flux, arguably the most sought-after parameter during a volcanic eruption, can be determined from the volume flux if the volcanic flow is well-characterized. Thus far, infrasound-based volume and mass flux estimates have yet to be validated. In February 2015 we deployed six infrasound stations around the explosive Sakurajima Volcano, Japan for 8 days. Here we present our waveform inversion method and volume and mass flux estimates of numerous explosions using a high resolution DEM and 3-D Finite Difference Time Domain modeling. Several ground-based instruments and methods are used to independently determine the volume and mass flux of individual volcanic explosions. We compare the volume and mass fluxes estimates and discuss sources of error and future improvements. Our technique may produce realistic estimates of mass flux and plume height and extent necessary for volcanic hazard mitigation.

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