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The 2010 Haiti earthquake revisited: an acoustic intensity map from remote atmospheric infrasound observations

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Following the January 12, 2010 Mw 7 Haiti earthquake, the shaking intensity near the epicenter was overestimated and the spatial extent of the potentially damaging shaking was underestimated. This was due to the lack of seismometers in the near-source region at the time of the earthquake.

Besides seismic-waves, earthquakes generate infrasound, i.e., inaudible acoustic-waves in the atmosphere. Here we show that infrasound signals, detected at distant ground-based stations, can be used to map the acoustic intensity, which is proportional to the shaking intensity. This is demonstrated with infrasound from the 2010 Haiti earthquake detected in Bermuda, 1738 km away. Wavefront parameters retrieved in a beamforming process are backprojected to map the measured acoustic intensity to the source region. Furthermore, we resolve the polarity in the epicentral region.

Infrasound measurements are conducted globally for the verification of the Comprehensive Nuclear-Test-Ban Treaty and although the network was designed to provide global coverage for nuclear explosions in the atmosphere, we show that there is also global coverage for the estimation of acoustic shaking intensity. In this study, we lay the groundwork that can potentially make infrasound-based ShakeMaps a unique operational IDC product alongside conventional ShakeMaps for earthquake disaster mitigation in sparsely monitored regions.

Promotional text

Remote infrasound detections can complement earthquake near-source seismic measurements. This can potentially make infrasound-based ShakeMaps a unique operational IDC product alongside conventional ShakeMaps for earthquake disaster mitigation in sparsely monitored regions.

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