Infrasonic and Seismic Signatures of the 2014 Askja Landslide

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Landslides commonly occur at active volcanoes and represent a major source of hazard for people and infrastructure. Due to the flank instability of volcanic edifices, landslides, or flank collapses, at active volcanoes can trigger major eruptions or produce tsunami waves when the material enters open or enclosed water bodies.

A large landslide occurred at Askja Volcano, Iceland, on July 21st, 2014. The landslide had a total volume between 30 and 50 million m3 and it originated from the southeast margin of the inner caldera, triggering a large tsunami into the lake. The tsunami wave inundated the shores all around the lake, reaching up to 40 m elevation above the lake level. The seismic waves produced by the landslide were recorded by most of the IMO's seismic stations in Iceland and allowed to establish the onset time around 23:24 UTC.
Events of this type may represent a serious risk if they occur in tourist spots such as the Askja region. We present observations of the July 21st, 2014 event as recorded by the national infrasonic arrays network installed in the country within the FUTUREVOLC European project. Infrasound released by the event was recorded at a distance of 210 km from Askja volcano.

We performed 2D FDTD modeling of the pressure wave propagation in the atmosphere in order to account for wind effects and atmospheric specification along the whole section from the source to the different arrays. Sound pressure level maps are evaluated for infrasound propagation towards the different arrays of the network.

We show how the comparison between seismic and infrasonic signals may be crucial in order to better define the timing and the dynamics of the event. An integrated analysis of the infrasonic and seismic signals effectively enhance our monitoring capabilities and hazard assessment related to geophysical phenomena occurring at the ground-atmosphere interface.