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Infrasound monitoring of active volcanoes at local and regional scale

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Infrasound has great potentials to monitor ongoing volcanic explosive eruptions at source-to-receiver distances up to 1000s of km. However, while at short distances (< few 10s km) its operational use is feasible and well demonstrated, at long range its efficiency is still debated, mostly because of time varying propagation effects and the ubiquity of infrasound signals produced by multiple sources. We present infrasound array analysis of eruptive activity at Etna volcano, Italy, performed at local (< 10 km) and regional distances (> 500 km) and apply detection algorithm to identify in real-time ongoing eruptions. We show how frequency-dependent semi-empirical relationships derived from parabolic equation simulations coupled with realistic atmospheric profiles allows to correct for attenuation and reconstruct the pressure time history with great accuracy. This allows applying the same threshold parameters defined for the local array. We show how regional arrays at distanced of >1000 km are able to pick eruptive activity of Etna with an efficiency of 87% and no false alerts. Considering the latency of ~1 hour related to propagation time, we show that remote infrasound detection of eruptive activity would be available before the actual notification, thus opening new perspective of real-time volcano monitoring at regional scale.

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