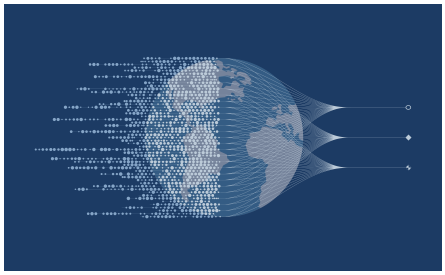

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gravity waves at source levels using long range infrasound waveforms

The propagation of infrasound through the atmosphere is highly sensitive to small scale disturbances that can significantly influence waveforms. Among these, gravity waves play a critical role and are typically parameterized in General Circulation Models (GCMs). This study investigates the performance of long range infrasound modeling in reconstructing non-orographic gravity waves fields. We analyse signals recorded at an infrasound station 300 km from controlled explosions at Hukkakero, Finland, during late summers from 2014 to 2017. Using the ERA5 data set from the European Centre for Medium-Range Weather Forecasts, combined with a gravity waves multiwave scheme, we derive gravity waves fields in the lower stratosphere. Coarse-grained, column based atmospheric variables are employed to capture day to day gravity waves variability. Full wave acoustic modeling is performed using a normal mode code developed at the Commissariat à l'énergie atomique et aux énergies alternatives. Our findings are twofold. First, we demonstrate the ability to reconstruct the influence of gravity waves on infrasound waveforms using acoustic full wave modeling. Second, we show that infrasound waveforms can be used to infer and calibrate gravity waves characteristics at their source levels in the troposphere. The calibrated gravity waves model can, in turn, be applied to solve the inverse problem of estimating the yield of explosions, with significant improvements in terms of accuracy and reliability.

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