

## **Estimating tropospheric and stratospheric large-scale wind components using infrasound from explosions**

We study large-scale wind effects on infrasound propagation to the seismic array ARCES, Norway, utilizing 30 years of data from around 600 ground truth events at the Hukkakero military blast-site in Finland, which all are well-constrained in location and origin time using seismic data. The wind component perpendicular to the infrasound propagation (cross-wind) will translate the wave a distance proportional to wind magnitude and travel time. Using observed deviations from the true azimuth to the explosion site, combined with the observed travel time, we demonstrate that an average large-scale cross-wind can be estimated solely from infrasound data. Our analysis shows that the infrasound-based estimation of the cross-wind has a high degree of correlation with the cross-winds extracted from ERA-interim atmospheric re-analysis models. We suggest using this approach for estimating the tropospheric and stratospheric large-scale wind components. These results also confirm that in an event localization context, without ground truth information, knowledge of the average cross-wind is of great value for event location improvement.

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