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Discrimination of Two Closely Spaced Infrasound Sources Using Ray-Tracing Modeling – A Case Study

During an infrasound field campaign clear infrasound signals were observed on 16 February 2012. Media reports suggested a gas explosion source in Luxemburg, but an inquiry with the Federal Armed Forces (Bundeswehr) Airforce Information Center confirmed a supersonic flight at approximately the same time and in the same region. This case thus provides the opportunity of identifying the true source from infrasound propagation modeling using ray-tracing, as a reasonable evasion scenario within the task of verifying the CTBT. In local seismic station data we identified seismo-acoustic arrivals hinting at a source near Bitburg, Germany. According to the ground-truth information, the supersonic flight path was at almost 11 km altitude. Ray-tracing modeling was carried out using the HARPA/DLR code towards the station profile east of Heilbronn and IMS station IS26 located between 250 and 560 km east-southeast from the sources. The modeling from a ground-based explosion in Luxemburg predicts a less complex arrival pattern compared to an infrasound source at altitude, consistent with the observations. Our case study therefore highlights the potential of resolving the ambiguity of source inversions, when only a few infrasound stations record an event, a case highly likely with only 60 IMS infrasound stations world-wide.

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