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vespagram-based approach to assess microbarom radiation and propagation models

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This study presents a vespagram-based approach for comparison between infrasound data recorded at the ground and simulated microbarom soundscapes in multiple directions simultaneously. Data recorded during 2014-2019 at the IS37 station in Bardufoss, Norway, have been processed in the framework of velocity spectrum analysis in order to generate images that present a signal power depending on time and direction (vespagrams). Calculations were performed for several frequency bands within the 0.1 - 0.6 Hz range. The modelled microbarom soundscapes were smoothed to account for the frequency-dependent array resolution. The infrasound data processed and modelled microbarom soundscapes were compared in three different aspects: i) azimuthal distribution of dominating signal, ii) signal amplitude, and iii) ability to track atmospheric changes during extreme events such as sudden stratospheric warmings (SSW). The results reveal good agreement between model and data and demonstrate the ability of vespagrams to monitor the microbarom azimuth distribution, amplitude, and frequency on a seasonal scale, as well as changes during SSWs. The presented vespagram-based approach is computationally low-cost and can uncover microbarom source variability. There is also potential for near-real-time diagnostics of the atmosphere and microbaroms, especially when applied to multiple stations, e.g. exploiting the CTBTO International Monitoring System network.

Promotional text

Infrasound waves originating in the ocean, propagating through the atmosphere, and recorded by the CTBTO station are compared to the model via the new approach. Results show good agreement. The approach has potential for near-real-time diagnostics of the atmosphere.

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