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On estimating the atmospheric wave activities using infrasound recording

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Under the umbrella of ARISE (Atmospheric Research InfraStructure in Europe), where a novel infrastructure integrating different atmospheric observation networks is aimed to be designed with one objective to help validating general circulation models of numerical weather prediction and to improve knowledge of upper atmosphere dynamics and its relation with lower layers, this study focuses on atmospheric wave activities obtained at the surface considering infrasound data.
As a starting point more than ten years of continuous data recorded at the two IMS infrasound arrays I26DE in the Bavarian Forest and I27DE in Antarctica is considered; whereas both absolute and differential pressure values are analyzed. Therefore atmospheric wave activities can be estimated ranging from 30 s periods up to 50 days. At the lower periods a clear decrease in spectral amplitudes is visible between roughly 3 to 5 minutes, which indicates the Brunt-Väisälä frequency. This spectral low shows a seasonal variation throughout the years and can be compared with the buoyancy frequency estimated from ECMWF models above the stations sites. At longer periods of a few days spectral amplitudes reflect the seasonal variation in duration and amplitude of gravity wave perturbations going along with low pressure cells.
Moreover, for estimating planetary wave activities the spectral behaviour of variation in the frequency of detections from infrasonic signals generated by microbaroms is analyzed. While the sources are continuous, especially in Antarctica, the number of detections strongly depends on local noise conditions and unperturbed ducting. Here a decrease in frequency of occurrence can provide a proxy for planetary wave activities, which create atmospheric turbulences yielding unstable infrasonic ducting.