

Results of Infrasound Interferometry

in Netherlands

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The travel time of infrasound through the stratosphere depends on the temperature and the wind. These atmospheric conditions could be estimated by determining the travel times between different receivers (microbarometers). Therefore the determination of the travel time of infrasound between different receivers becomes more and more important. An approach to determine the travel time is the infrasound interferometry.

In this work the applicability of interferometry to synthetic data of active and passive sources refracted by the stratosphere is tested. The synthetic data were generated with a raytracing model. The inputs of the raytracing model are the atmospheric conditions and a source wavelet. As source wavelet we used blast waves and microbaroms. With the atmospheric conditions and the source wavelet the raytracing model calculates the raypath and the travel time of the infrasound. In order to simulate the measurement of a receiver the rays which reach the receiver need to be found. The rays which propagate from a source to the receiver are called eigen rays. The simulation of the receiver measurements takes into account the travel time along the eigen ray, the attenuation of the different atmospheric layers, the spreading of the rays and the influence of caustics. The simulated measurements of the different receivers are combined to synthetic barograms.

With the described model were two kind of synthetic experiments realized. In the first experiment the interferometry was applied to barograms of active sources like blast waves. The second experiment with microbaroms tests the applicability of interferometry to barograms of passive sources.

In the next step the interferometry will be applied to measured barograms. These barograms are measured with the 'Large Aperture Infrasound Array' (LAIA). LAIA is being installed by the Royal Netherlands Meteorological Institute (KNMI) in the framework of the radio-astronomical 'Low Frequency Array' (LOFAR) initiative. LAIA will consist of thirty microbarometers with an aperture of around 100 km. The in-house developed microbarometers are able to measure infrasound up to a period of 1000 seconds, which is in the acoustic-gravity wave regime. The results will also be directly applicable to the verification of the 'Comprehensive Nuclear-Test-Ban Treaty' (CTBT), where uncertainties in the atmospheric propagation of infrasound play a dominant role.

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