



A Large Aperture Infrasound Array in the Netherlands for interferometric studies

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To measure infrasound, microbarometer arrays are installed all over the world. In the framework of the radio-astronomical 'Low Frequency Array' (LOFAR) initiative of the Netherlands, the 'Large Aperture Infrasound Array' (LAIA) is being installed by the KNMI. LAIA will consist of thirty receivers and will have an aperture of 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 propagation of the infrasound depends on the temperature and the wind in the atmosphere. There are several models of the distribution of temperature and wind at different altitudes. A goal of this research is to probe the atmosphere to retrieve information of wind and temperature in the atmosphere through actual observations.

Is it possible to probe the atmosphere with infrasound in order to evaluate the model of the atmosphere and even retrieve such information on finer temporal and spatial scale? We need knowledge about the source, if we want to isolate the influence of the atmosphere on infrasound propagation. A way to separate the influence of the atmosphere without knowing the sound source in detail is to use interferometry. Via crosscorrelation of the ambient noise between several infrasound receivers the time lags of the infrasound can be determined. Through these lags and with the distances between the receivers it is possible to estimate a velocity model and consequently the parameters of the model of the atmosphere.

In this paper, LAIA will be introduced and the implementation and the evaluation of the interferometric approach will be described. For this reason a model of the atmosphere was simulated. The interferometry was applied to the data obtained from this simulation in collaboration with the TU Delft. In further experiments the interferometry will also be applied to measured data from LAIA. This will enable the evaluation of atmospheric models. Furthermore, the results will directly be applicable to the verification of the 'Comprehensive Nuclear-Test-Ban Treaty' (CTBT), where uncertainties in the atmospheric propagation of infrasound play a dominant role.