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# of statistical models for infrasonic propagation: application to the detection capability of the IMS network.

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The detection capability of the International Monitoring System (IMS) deployed to monitor compliance with the Comprehensive Nuclear-Test ban Treaty (CTBT) is highly variable in space and time. Previous studies estimated the source energy from remote observations using empirical yield-scaling relations. However, these relations simplified the complexities of infrasound propagation as the wind correction applied does not account for an accurate description of the middle atmosphere along the propagation path. In order to reduce the variance in the calculated transmission loss, massive frequency and range-dependent full-wave propagation simulations are carried out, exploring a wide range of realistic atmospheric scenarios. A cost-effective approach is proposed to estimate the transmission losses at distances up to 4,000 km along with uncertainties derived from multiple gravity wave realizations. Transmission loss statistics are combined with an explosive source model and noise statistics to quantify the 90% probability detection threshold of the IMS network. In the context of the future verification of the CTBT, this approach helps advance the development of network performance simulations in higher resolution and the evaluation of middle atmospheric models at a global scale with limited computational resources.

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