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of the Infrasound Transmission Loss Probabilities for New Station Deployment Using LSTM

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Infrasound propagation depends on the winds and temperature in the atmospheric column. These are highly variable, making it difficult to predict propagation conditions in the future based on those in the past. Recently, this problem has been addressed by studying the statistical properties of historical atmospheric profiles in order to generate statistical models for the signal propagation. Previous studies have focused on long-range propagation in the stratosphere. Here, we focus on shorter range propagation, restricted to the troposphere and use a machine learning model investigate the robustness of such an approach.
In this study a large number of historical WRF (Weather Research and Forecasting) atmospheric profiles between 2018 to 2024 were generated for March. Transmission losses (tlosses) were estimated from PE simulations for 1 to 4 Hz with a range of 100 km from the desired source. In addition, the atmospheric parameters for March 2018 to 2022 and the equivalent Probability Density Functions (PDFs) of tlosses were trained using Long Short-Term Memory (LSTM) algorithm.
In conclusion, the resulted trained models can be used to predict the hourly PDFs of tlosses for March 2023 and 2024. Furthermore, these models' usage can extend to different untrained source points with different atmospheric conditions.

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