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Hydroacoustic blockage prediction and measurement at Diego Garcia using the Adiabatic Mode Parabolic Equation Model

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Underwater explosion monitoring with sparse sensors at long ranges relies on the efficient propagation of acoustic energy in the Sound Fixing and Ranging (SOFAR) channel. When sound traveling in this channel encounters an island or seamount, it will either diffract, scatter, or be converted into seismic energy. Signals observed on the opposite side of these obstructions have been affected by some combination of these processes, and models of global detection and localization depend on knowing these effects. We present a study using the Adiabatic Mode Parabolic Equation (AMPE) model to predict these processes in three dimensions at the Chagos Archipelago. Predictions at 5, 10, and 20 Hz are compared with measurements of approximately 300 T-wave signals from six years of earthquakes on either side of the Chagos Archipelago. These have been recorded at the hydrophone arrays around Diego Garcia. The result of this 360-degree analysis, and the agreement with observed data, demonstrate the utility of the model in understanding the physical effects of these obstructions.