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Evolution of the statistics of the unscattered component of low order acoustic modes as a function of range

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Scattering due to internal waves in the ocean causes the acoustic modes to exchange energy as they propagate. At a specific range, the mode signal consists of two components: the unscattered component is the energy that has propagated only in the designated mode and the scattered component contains the contributions from other modes. The unscattered component dominates the signal at short ranges, but decays to zero at longer ranges. If the unscattered component can be isolated from the scattered energy, it could be used in tomographic inversions. Signal processing techniques are needed to detect the unscattered component. A statistical model for the unscattered component that would help design signal processing techniques is currently unavailable. This talk describes a new model for the unscattered component that was developed using coupled mode and parabolic equation simulations. The model characterizes the statistics of the unscattered component using parameters such as frequency and time coherence. The characteristics of the unscattered component are then compared with the scattered component. The implications of these results for the design of detectors is briefly discussed. [Work supported by ONR Ocean Acoustics Graduate Traineeship Award]