

An Analytic Smoothing of an Internal Wave Sound Speed Model

Mrs. Katherine C. Hegewisch

Graduate Student, Washington State University, Physics Department
khegewisch@wsu.edu 509-335-7286

Dr. Nicholas R. Cerruti, Ph.D.

Assistant Research Professor, Washington State University, Physics Department
ncerruti@wallowa.physics.wsu.edu 509-335-7286

Prof. Steven Tomsovic, Ph.D.

Full Professor, Washington State University, Physics Department
tomsovic@wsu.edu 509-335-7286

Abstract: Brown and Colosi (JASA 103(4), 2232 (1998)) introduced an efficient numerical scheme for the internal wave perturbations in the deep ocean sound speed model that reproduces the Garrett-Munk spectrum. This scheme allows for the addition of an infinite number of vertical modes with decreasing wavelengths to the potential. Since wave propagation can only detect features of the potential on the order of the smallest wavelength in the wave packet, there exists a maximum number of modes that are physically relevant to the wave propagation. The maximum mode depends only on the spread and center frequency of the source. Although including the maximum number modes is computationally demanding, these modes are necessary in order to capture all the dynamics contained in the ocean model. Additionally, the effects of internal waves have been shown to introduce chaos into geometrical ray tracing methods and will eventually cause these methods to breakdown for long ranges. We introduce a smoothing of the internal wave model which filters out the high frequency components in each mode, but does not significantly alter the propagated wavefield. The smoothing does, however, eliminate the small scale structures in the classical manifolds and allows the ray methods to be extended in range. [This work was supported by ONR.]