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Eulerian Simulation of Acoustic Waves Over Long Range in Realistic Environments[1] SUBHASHINI CHITTA, JOHN STEINHOFF, Wave CPC, Inc. — In this paper, we describe a new method for computation of long-range acoustics. The approach is a hybrid of near and far-field methods, and is unique in its Eulerian treatment of the far-field propagation. The near-field generated by any existing method to project an acoustic solution onto a spherical surface that surrounds a source. The acoustic field on this source surface is then extended to an arbitrarily large distance in an inhomogeneous far-field. This would normally require an Eulerian solution of the wave equation. However, conventional Eulerian methods have prohibitive grid requirements. This problem is overcome by using a new method, "Wave Confinement" (WC) that propagates wave-identifying phase fronts as nonlinear solitary waves that live on grid indefinitely. This involves modification of wave equation by the addition of a nonlinear term without changing the basic conservation properties of the equation. These solitary waves can then be used to "carry" the essential integrals of the acoustic wave. For example, arrival time, centroid position and other properties that are invariant as the wave passes a grid point. Because of this property the grid can be made as coarse as necessary, consistent with overall accuracy to resolve atmospheric/ground variations.

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