

SOLUTIONS OF ACOUSTIC WAVE PROPAGATION  
IN THE OCEAN  
BY THE PARABOLIC APPROXIMATION  
TO THE WAVE EQUATION

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## ABSTRACT

The use of the parabolic approximation to the wave equation was introduced in 1973 by R. Hardin and F. Tappert for full field prediction of long range acoustic propagation in an inhomogeneous ocean. In this paper it is shown that the parabolic method does not yield solutions which represent either ray or normal-mode theory solutions, except in appropriate limits. A correction term which eliminates a major error in the parabolic approximation is suggested, and will be especially important in applications to low frequency acoustic propagation. Exact calculations done for the example of the diffraction-limited focus of an objective lens located in a homogeneous duct show the nature and range of errors generated by the uncorrected parabolic method.