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The analysis of nonlinear internal wave induced by arbitrary pressure distribution in a stratified flow

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SUMMARY

Nonlinear internal waves induced by arbitrary pressure loads in a stratified flow are treated, and the analytical solutions are given. When a body submerged underwater moves in a stratified fluid with an interface, the internal wave created by its motion is mainly behind it and, generally, has a larger amplitude than surface waves. The analytical solutions are supplied by applying Rayleigh and Lamb methods to linear waves on the free surface with infinite depth. Physically, the difference between the linear and nonlinear waves is the transmission of the water particles. And mathematically, the ratio of the maximum elevation to the wave-length cannot be small. It is shown that for a stratified-flow category, a number of differences are influenced by interfacial Froude numbers between the two methods. In addition, these variances derived from the Froude numbers are interpreted physically. Furthermore, variable depth-ratios are treated for the case of nonlinear internal waves. In this treatment the singularity and the critical Froude number is demonstrated. The purpose of this study is to analyze the effects of the nonlinearity, to compare the different results derived from different pressure distribution functions by the above two analytical methods and to develop the appropriate model which is capable of solving the similar problem under any other conditions.