

On the homotopy multiple-variable method and its applications in the interactions between nonlinear gravity waves

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Abstract:

In this talk, a homotopy-based multiple-variable method is proposed to investigate the interactions of fully-developed periodic traveling primary waves. This method does not depend upon any small physical parameters at all and thus is more general than the famous multiple-scale technique in perturbation methods. By means of this technique, it is found that, for a fully developed wave system, the amplitudes of all wave components are constant even if the wave resonance condition given by Phillips (1960) is exactly satisfied. Besides, it is revealed that there exist multiple solutions for the resonant waves, and that the amplitudes of resonant wave may be much smaller than those of primary waves. Furthermore, a generalized resonance condition for arbitrary number of periodic traveling waves is given, which logically contains Phillips' resonance condition and opens a way to investigate the interaction of more than four traveling waves.

References:

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