Scattering of flexural–gravity waves by a group of elastic plates floating on a stratified fluid

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Scattering of flexural–gravity waves by a group of elastic plates floating on a stratified fluid

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A hydroelastic problem of flexural–gravity wave scattering by a demarcation between two floating elastic plates is investigated within the frame of linear potential-flow theory, where the method of matched eigenfunction expansions is employed for analysis. The formulations are subsequently generalized to the case of multiple elastic plates on a stratified fluid with multiple layers, which is helpful to the study of the hydrodynamic behaviors of inhomogeneous floating covers as well as the effects of density stratification in seawater. The eigenfunction expansions are numerically calculated by an inner product technique, in which an orthogonal definition involving an explicit differential term exhibits the effectiveness in dealing with the multi-layer matching relations between adjacent regions covered by different elastic plates. By use of Green's theorem, an energy conversation relation is deduced to assure the convergence of the calculation. The high converging rates are exhibited afterwards. The correctness of numerical results are also verified by comparing with a previous analytical method. The details of the hydrodynamic responses of the generalized extension, especially the impact of the fluid stratification on the inner forces of the elastic plates, are discussed for different situations.

Keywords: Flexural–gravity wave; Multiple elastic plates; Multiple layers; Matched eigenfunction expansion; Orthogonality

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