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Resonant triad interactions of acoustc–gravity waves USAMA KADRI, T.R. AKYLAS, MIT — Surface–acoustic wave disturbances in water of constant depth over a rigid bottom, due to the combined action of gravity and compressibility, are studied. In the linear theory, apart from free-surface (gravity) waves, there is also a countable infinity of acoustic (compression) modes. As the sound speed in water, typically, far exceeds the maximum gravity wave phase speed, these two types of modes feature vastly different spatial and/or temporal scales, and their linear coupling is weak. It is possible, however, to realize significant energy exchange between gravity and acoustic waves via nonlinear interactions. This scenario is analyzed for resonant wave triads that comprise two counter-propagating gravity waves and a long-crested acoustic mode. Owing to this disparity in length scales, the interaction time scale as well as the form of the amplitude evolution equations differ from those of a standard resonant triad. In the case of a perfectly tuned triad of uniform monochromatic wave trains, nearly all the energy initially in the gravity waves can be transferred to the acoustic wave. This mechanism, however, is less efficient when the interacting waves are modulated wavepackets.

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