Group-wave resonances in nonlinear dispersive media: The case of gravity water waves

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The dynamics of coherent nonlinear wave groups is shown to be drastically different from the classical scenario of weakly nonlinear wave interactions. The coherent groups generate nonresonant (bound) waves which can be synchronized with other linear waves. By virtue of the revealed mechanism, the groups may emit waves with similar or different lengths, which propagate in the same or opposite direction.
The discovered effects are rather weak and hence hardly can influence noticeably the wave dynamics in the kinetic sense. However the conclusions of the study help to understand better the processes which make the wave dynamics in ideal fluid different from the one in integrable systems. In particular, the fully nonlinear counterpart of the breather solution of the nonlinear Schrodinger equation exhibits almost complete (but not perfect) recurrence even in the most refined case.

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