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The Alber equation: quantitative analysis of the onset of MI for realistic sea states

The modulation instability (MI) is a very widely known feature of nonlinear dispersive waves. In water waves, where it is also known as Benjamin-Feir instability, it is often discussed in the context of realistic sea states and rogue waves. However, the classical MI is a linear instability which applies only to plane waves. Any other sea states, having even a "very narrow" power spectrum, does not directly fall under the assumptions of the MI. Or, in other words, just how narrow can a spectrum can become before MI kicks in? In this talk I will present recent results, obtained in collaboration with G. Athanassoulis, M. Ptashnyk, T. Sapsis and O. Gramstad, on the Alber equation -- that is on a linear stability analysis analogous to the MI, but which takes place on a phase-averaged level around a given power spectrum. Having solved many of the mathematical difficulties associated with the Alber equation, it will be shown how concrete quantitative predictions on the onset of MI in realistic sea states can be obtained and validated.