Oberseminar Nichtlineare Differentialgleichungen

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Interaction of modulated gravity water waves of finite depth

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Abstract: We investigate the macroscopic manifestation of interaction of amplitude-modulated gravity water waves of two horizontal dimensions and finite depth. More precisely, we consider three plane waves that solve the linearized problem and modulate their ϵ-order amplitudes over the macroscopic time- and space-scales $t' = \epsilon t$ and $(x',y') = \epsilon(x,y)$. As is well-known, for pure gravity water waves there occur no quadratic resonances between three plane waves, in contrast to the situation for capillary-gravity water waves. This implies that here the three modulated amplitudes do not couple at leading order. However, as we will see, at next-to-leading order a coupling occurs for the ϵ-order corrections of these amplitudes. The validity of the obtained coupled system of modulation equations is then justified rigorously on a macroscopic time scale of order $O(1/\epsilon)$.

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