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Long wave expansions for water waves over random bottom

We introduce a technique, based on perturbation theory for Hamiltonian PDEs, to derive the asymptotic equations of the motion of a free surface of a fluid over a rough bottom (one dimension). The rough bottom is described by a realization of a stationary mixing process which varies on short length scales.

We show that the problem in this case does not fully homogenize, and random effects are as important as dispersive and nonlinear phenomena in the scaling regime. We will explain how these technique can be generalized to higher dimensions.