Wave turbulence in shallow water: theory and numerical simulations

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ABSTRACT

Here we consider the nonlinear energy transfer in the standard Boussinesq equations in flat bottom conditions. Using the method of the multiple scales, we derive a shallow water version of the Zakharov equation. We then use the standard statistical methods to derive the *Boussinesq kinetic equation*, i.e. an Hasselmann type of equation corresponding to the Boussinesq equations; its relation to the arbitrary depth version of the Hasselmann equation is given. Using dimensional arguments, a power law solution corresponding to a constant flux of energy is found for the Boussinesq kinetic equation. Comments on the relevance of such result for wave forecasting will be given. Simulations of the Boussinesq equations and the fully nonlinear Euler equations in shallow water will be also discussed.