Abstract Submitted
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Experiment realization of a soliton gas in shallow water[1] NICOLAS MORDANT, IVAN REDOR, ERIC BARTHELEMY, HERVE MICHALLET, Laboratoire des Ecoulements Geophysiques et Industriels, Universite Grenoble Alpes, MIGUEL ONORATO, Dipartimento di Fisica, Universita di Torino and INFN, 10125 Torino, Italy — Solitons are nonlinear waves that behave as quasi particles and undergo elastic collisions. Solitons are typical solutions of integrable equations including the famous Korteweg-de Vries equation for shallow water propagation. Here we focus on the case of integrable turbulence (or soliton gas) which is a random state made of a large ensemble of nonlinear waves. Due to the integrable nature of the evolution, no classical thermalization can occur and the question of the large time statistical properties of such state remains open. Here we focus on the case of shallow water and we present a laboratory realization of such a soliton gas. We use a 34m-long flume with a water depth of 12 cm. A large number of solitons can be obtained by taking advantage of the decomposition of an initial sine wave forced by a piston wave maker into trains of solitons. Additionally we have a reflective end to the flume so that to keep solitons in the flume for a long time. Although our system is dissipative as viscosity cannot be avoided, the short time propagation is consistent with integrable behavior and we observe a soliton gas which statistical properties are consistent with numerical simulations of conservative waves.

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