Abstract Submitted
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From weak to strong turbulence: a traveling wave tour FRANCESCO FEDELE, Georgia Institute of Technology — The weak wave turbulence of Zakharov unveiled the dynamics of ocean waves as that of a sea of nonlinearly interacting dispersive elementary waves. Their dispersive properties and energy cascade can be observed and measured in the ocean. In this regard, I will discuss recent experiments off the Venice coast that exploit a Variational Wave Acquisition Stereo System (VWASS) to study the space-time dynamics of sea waves [Fedele et al. 2013, Ocean Modeling]. The delicate balance of dispersion and nonlinearities may yield the formation of solitons or traveling waves [Fedele & Dutykh 2012, JFM 712:646]. These are introduced in the context of the Euler equations and the associated third order compact Zakharov equation. Traveling waves exist also in the strong turbulence of the Navier-Stokes (NS) equations. Indeed, for bounded geometries I will show that the NS equations can be reduced to generalized Camassa-Holm equations [Fedele 2012, Fluid Dyn. Res. 44:045509; Fedele & Dutykh 2013, EPL 101:34003]. From a dynamical system perspective, in phase space the associated vector field supports an invariant group orbit manifold, which corresponds in physical space to smooth and singular axisymmetric vortexons [5].

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