

Nonstationary phenomena in second-sound acoustic turbulence in He II

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We report an investigation of transient phenomena in the evolution and decay of second sound acoustic turbulence in He II, considering both the direct and inverse energy cascades. During growth of the direct cascade, after first switching on the thermal driving force, the initial growth rates of the harmonics increase rapidly with harmonic number. This corresponds to a propagating front in frequency space, precisely as predicted by a theoretical description based on self-similarity.¹ During growth of the inverse cascade, rogue waves arise in direct analogy with the oceanic rogue waves that endanger shipping.² The decay of a fully-established cascade after switching off the driving force sometimes exhibits oscillations. We also report a study of the decay of the direct cascade in the case where the system is initially driven by two resonant drivings at different frequencies. It was found that the energy redistribution between the interacting harmonics can result in the *growth* of some modes after one of the harmonic drives is removed. These diverse phenomena will be discussed and set in context.

¹A N Ganshin et al, *New J. Phys.* **12**, 083047 (2010).

²V B Efimov et al, *Eur. Phys. J. Special Topics* **185**, 181–193 (2010).