

Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Fluctuation Spectra Underlie the Behavior of Non-equilibrium Systems ALPHA LEE, Harvard University, DOMINIC VELLA, University of Oxford, JOHN WETTLAUFER, Yale University — A diverse set of important physical phenomena, ranging from hydrodynamic turbulence to the collective behaviour of bacteria, are intrinsically far from equilibrium. Despite their ubiquity, there are few general theoretical results that describe these non-equilibrium steady states. Here we argue that a generic signature of non-equilibrium systems is nontrivial fluctuation spectra. Based on this observation, we derive a general relation for the force exerted by a non-equilibrium system on two embedded walls. We find that for a narrow, unimodal spectrum, the force depends solely on the width and the position of the peak in the fluctuation spectrum, and will oscillate between repulsion and attraction. We demonstrate the generality of our framework by examining two apparently disparate examples: the Maritime Casimir effect and recent simulations of active Brownian particles. A key implication of our work is that important non-equilibrium interactions are encoded within the fluctuation spectrum. In this sense the noise becomes the signal.

Alpha Lee
Harvard University

Date submitted: 06 Nov 2015

Electronic form version 1.4