# Clustering of matter in waves and currents

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The growth rate of small-scale density inhomogeneities (the entropy production rate) is given by the sum of the Lyapunov exponents in a random flow. We derive an analytic formula for the rate in a flow of weakly interacting waves and show that in most cases it is zero up to the fourth order in the wave amplitude. We then derive an analytic formula for the rate in a flow of potential waves and solenoidal currents. Estimates of the rate and the fractal dimension of the density distribution show that the interplay between waves and currents is a realistic mechanism for providing patchiness of pollutant distribution on the ocean surface.

This work can be found on http://arxiv.org/abs/nlin.CD/0612001 and has been submitted to Phys. Rev. Lett.