



# Diffusion of heat, energy, momentum and mass in one-dimensional systems

Shunda Chen, Yong Zhang, Jiao Wang, Hong Zhao

(Submitted on 15 Jun 2011 (v1), last revised 3 Mar 2012 (this version, v2))

Relaxation is crucial for understanding various nonequilibrium processes. However, in general how the fluctuations of a physical quantity may evolve is still elusive. Here we show by examples that fluctuations of heat, energy, momentum and mass may have dramatically distinct diffusion behaviors in a system and vary from system to system. As an important consequence, the diffusion of fluctuations of a given physical quantity can not be explored by studying that of other physical quantities. In particular, recent efforts trying to establish a general connection between heat conduction and energy diffusion, and those trying to explore heat waves by investigating the diffusion processes of quantities other than heat, are questionable. Nevertheless, we show that for the same physical quantity, a universal connection may exist to link its relaxation and transport such as heat diffusion and heat conduction.

Comments: 26 pages, 6 figures

Subjects: **Statistical Mechanics (cond-mat.stat-mech)**; Chaotic Dynamics (nlin.CD)

Cite as: [arXiv:1106.2896](#) [cond-mat.stat-mech]  
(or [arXiv:1106.2896v2](#) [cond-mat.stat-mech] for this version)

## Submission history

From: Zhao Hong [[view email](#)]

[v1] Wed, 15 Jun 2011 07:55:48 GMT (279kb)

[v2] Sat, 3 Mar 2012 07:31:51 GMT (752kb)

[Which authors of this paper are endorsers?](#)

Link back to: [arXiv](#), [form interface](#), [contact](#).

## Download:

- [PDF only](#)

Current browse context:

cond-mat.stat-mech

[< prev](#) | [next >](#)

[new](#) | [recent](#) | [1106](#)

Change to browse by:

[cond-mat](#)

[nlin](#)

[nlin.CD](#)

## References & Citations

- [NASA ADS](#)

## Bookmark (what is this?)

