

DY 17: Invited Talk Bernhard Mehlig

Time: Tuesday 10:30–11:00

Location: H19

Invited Talk

DY 17.1 Tue 10:30 H19

Caustics in turbulent aerosols — ●BERNHARD MEHLIG — University of Gothenburg

Turbulent aerosols are suspensions of heavy particles in a turbulent fluid – such as water droplets in the turbulent air of a cumulus cloud, or dust grains in the turbulent gas around a growing star. The analysis of such highly non-linear and multi-scale problems poses formidable challenges. Experiments resolving the particle dynamics have only recently become possible, and direct numerical simulations of such systems are still immensely difficult.

Here I describe a different approach, to analyse the dynamics of turbulent aerosols in terms of synthetic turbulence models, using methods from non-equilibrium statistical physics and dynamical-systems theory. Although the models are highly idealised, their analysis has led to significant progress in understanding the mechanisms determining the particle dynamics. As an example I discuss the formation of mathematical catastrophes in the phase-space dynamics of turbulent aerosols, akin to caustics in geometrical optics. I describe where and how often these singularities form, and I explain their physical significance. I conclude with a discussion of successes and limitations of this statistical approach, and with a summary of open questions.