

# Nonlinear response and fluctuations of a driven tracer in simple model fluids

Alessandro Sarracino \*

[alessandro.sarracino@roma1.infn.it](mailto:alessandro.sarracino@roma1.infn.it)

---

We present some recent results on the dynamics of a tracer particle driven by an external force beyond the linear regime, in two different model fluids. We first focus on a lattice gas model, where the tracer interacts via hard-core repulsion with a crowding particle bath. In this model two surprising behaviors can occur: negative differential mobility, namely a non monotonic force-velocity relation, and enhanced diffusivity induced by the crowding interactions. An analytical approach based on a decoupling approximation accounts for these nonlinear, non-equilibrium effects, in very good agreement with Monte Carlo numerical simulations. Then, we consider the dynamics of a driven inertial particle in a steady laminar flow. In this case, we can observe the phenomenon of absolute negative mobility, namely a stationary velocity of the tracer opposite to the applied external force. For this model we also discuss a generalized fluctuation-dissipation relation involving the correlation with a non-equilibrium extra-term.

---

\*Dipartimento di Ingegneria, Università della Campania “L. Vanvitelli”, via Roma 29, 81031 Aversa CE, ITALY