Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Turbulent Soret Effect[1] DHRUBADITYA MITRA, NORDITA, NILS ERLAND L. HAUGEN, NTNU, SINTEF Energy Research, IGOR ROGACHEVSKII, Ben-Gurion University of the Negev — We study, turbophoresis–the clustering properties of heavy inertial passive particles in a inhomogeneous turbulent flow–by direct numerical simulation of inhomogeneously forced turbulence in a periodic box without walls. The forcing is a periodic function of one coordinate direction. The inertial particles cluster near the minima of the turbulent kinetic energy. Draw- ing analogy with Soret effect in near-equilibrium thermodynamics, we can describe the flux of particles as a sum of two fluxes, described by two turbulent transport coefficients, turbulent diffusion of particles and turbophoretic coefficient. The second (turbophoretic) flux is assumed to be proportional to the gradient of turbulent intensity. The ratio of these two coefficients would be analogous to Soret coefficient, hence we call this the turbulent Soret coefficient. Our numerical calculation show that such a description is a good description of our data. Furthermore, we find that the turbulent Soret coefficient is a non-monotonic function of the particle inertia (described the the Stokes number); i.e. beyond a critical Stokes number the clustering of the particles decreases, but in a smooth manner.

[1]Swedish Research Council, Wallenberg Foundations

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Date submitted: 07 Jul 2015 Electronic form version 1.4