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Aerosol particle motion induced by non-linear sound waves JAY CLECKLER, FENG LIU, SAID ELGHOBASHI, UCI — Solid or liquid particles with small response times execute periodic motion when exposed to acoustic waves of significant amplitudes. The amplitude of particle velocity oscillations and the degree to which these oscillations lag acoustic velocity oscillations depend on the ratio of the particle response time to the acoustic period. For small amplitudes, experimental data deviate slightly from basic theory. Data are scarce for the motion of aerosol particles in large amplitude acoustic waves. These large amplitude waves display nonlinear steepening among other effects which may affect particle trajectories. These nonlinearities are primarily due to convection and result in modifying the oscillations of particles exposed to these acoustic waves. This presentation summarizes the results of numerical simulations in which a particle is exposed to fully nonlinear acoustic waves. The unsteady two- dimensional compressible Navier-Stokes and energy equations are solved for a laminar flow via the numerical method of Wall et al. (JCP, 2002). The particle motion equation is solved to obtain the particle trajectories. Computed particle trajectories, as a function of acoustic amplitude, frequency and particle response time are compared with basic theory and the experimental data of Gonzalez et al. (JAS, 2000). Particle trajectories are also computed at larger wave amplitudes that cannot be currently achieved in experiments.

Said Elghobashi
Univ. of California, Irvine (UCI)

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