Abstract Submitted
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Partial Extinction and the Rayleigh Index in Acoustically Driven Fuel Droplet Combustion[1] DARIO VALENTINI, University of Pisa, PHUOC HAI TRAN, BRETT LOPEZ, ARI EKMEKJI, OWEN SMITH, ANN KARAGOZIAN, UCLA — This experimental study examines burning liquid fuel droplets exposed to standing acoustic waves created within an atmospheric pressure waveguide. Building on prior studies which study relatively low-level excitation conditions in which the droplet is situated in the vicinity of a pressure node (PN), [2] the present experiments focus on higher amplitude excitation which can lead to periodic flame extinction. Phase-locked OH* chemiluminescence imaging reveals temporal oscillations in flame standoff distance from the droplet as well as chemiluminescent intensity in response to the applied acoustic perturbations. Temporal variation in the chemiluminescent intensity as well as pressure in the vicinity of the burning droplet enable quantification of combustion-acoustic coupling via the Rayleigh index. While the sign of the Rayleigh index is consistent with oscillatory combustion during low-level acoustic excitation, when periodic partial extinction occurs at higher amplitude excitation, the Rayleigh index is insufficient to fully represent such coupling. Alternative metrics and methods are explored to enable a more robust study under such conditions.

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[2]Sevilla, et al., Comb. Flame **161**, pp. 1604-1619, 2014

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