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Transient OH* Chemiluminescence Imaging of Acoustically Coupled Fuel Droplet Combustion[1] JEFFREY WEGENER, CRISTHIAN SEVILLA, JENNIFER SMOLKE, AARON SUNG, KELVIN CHEN, OWEN SMITH, ANN KARAGOZIAN, UCLA — This study focuses on combustion of liquid fuel droplets during exposure to external acoustic disturbances generated as standing waves within a closed acoustic waveguide. During such acoustic excitation, the mean flame orientation is observed to be dependent on the droplet's location relative to the pressure node (PN), and is consistent with the sign of a theoretical acoustic acceleration acting on the burning system. Yet experimentally estimated acoustic accelerations, measured from the degree of mean flame deflection, differ substantially in a quantitative sense from those predicted by theory.[2] Phase-locked OH* chemiluminescence imaging reveals a deflected flame which oscillates in position relative to the droplet, with the largest degree of oscillation near the PN. A range of acoustic forcing frequencies and droplet locations are used to investigate flame movement over multiple acoustic cycles. The degree of flame oscillation, mean flame deflection angle, and fuel droplet burning rate all correlate with one another for different relative positions of the droplet.

[1]Supported by AFOSR.
[2]Tanabe, et al., **Proc. Comb. Inst.**, 2000

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