Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Laminar Flame Dynamics of Multi-Port Fuel Jets Under Acoustic Forcing[1] ANDRES VARGAS, JOSE GUERRERO, SARINA KIANI, ANN KARAGOZIAN, University of California, Los Angeles — The present experiments investigate the response of multi-port gaseous jet diffusion flames to applied transverse acoustic forcing corresponding to a standing wave at a resonant frequency of 332 Hz. Microjet flames with jet Reynolds numbers in the range of 20 to 100 were explored and high speed visible imaging enabled time-resolved quantification of intensity-based flame response. The oscillatory flames were analyzed via proper orthogonal decomposition (POD) to extract spatial modes and their corresponding phase trajectories via POD coefficient plots. Different regimes of flame response were identified based on the degree of forcing, including weakly oscillatory combustion, transition to multi-mode periodic liftoff, and highly perturbed periodic liftoff and reattachment of the flame preceding extinction. Sparse mode distribution and symmetries in the phase portraits at low amplitude excitation suggested that a reduced order model could be used to predict the observed transitions in the combustion process, and this will be described in a separate study [Alves, et al., APS DFD 2020].

[1]Supported by AFOSR Grant FA9550-19-1-0096 (PO: Dr. Mitat Birkan)

Andres Vargas
University of California, Los Angeles

Date submitted: 31 Jul 2020 Electronic form version 1.4