A COMPUTATIONAL INVESTIGATION OF FLAME BEHAVIOR AND SOOT PRODUCTION AND TRANSPORT WITH AN ACETYLENE-AIR LAMINAR DIFFUSION FLAME IN THE FIELD OF INTERACTING LINE VORTICES

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In the present ongoing work the authors are investigating the flame behavior and the corresponding effects on soot production and transport in the field of interacting line vortices. An acetylene-air laminar diffusion flame is being studied. This work is based on the earlier work by the authors [1], which was an experimental study of a single vortex interacting with acetylene-air laminar diffusion flame. The computational domain used in this study is shown in Fig. 1(a). The dimensions of the computational domain are the same as that used in [1]. The soot model used in our study is based on the work of Lindstedt [2] and Lee [3]. The simulation is being done on the commercial CFD software fluent 6.3.26. Line vortices of same and different strengths are introduced from air side, fuel side and from both sides. The resulting flame structure and dynamics are being studied. The temporal and spatial evolution of flame is found to exhibit significant bearings on the temporal and spatial distribution and evolution of soot. Fig 1(b) schematically shows the interaction of two line vortices.

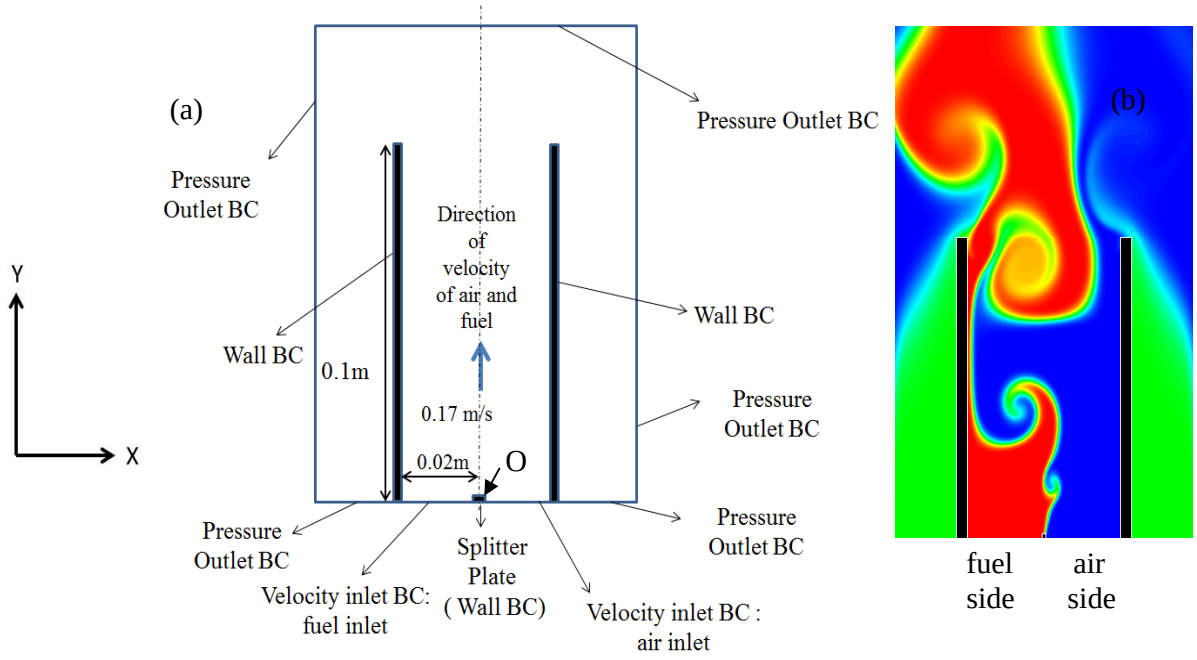

Figure1. (a) The computational domain and the boundary conditions (O is the origin) (b) schematic showing interaction of vortices of same strength, introduced from fuel side then from air side

References

[1] B.M. Cetegen, S. Basu; *Combustion and Flame*, vol.146, 2006, 687–697
[2] K.M. Leung, R.P. Lindstedt, W.P. Jones; *Combustion and Flame*, vol. 87, 1991, 289–305
[3] Lee et al.; *Combustion and Flame*, vol. 6, 1962, 137 – 145