LES of a Bluff Body Stabilized Premixed Flame Using a Combined Level Set and Ghost Fluid Methods

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Abstract

Present-day demands on combustion equipment are increasing the need for improved understanding and prediction of turbulent combustion. Large Eddy Simulation (LES), in which the large-scale flow is resolved on the grid, leaving only the small-scale flow to be modeled, provides a natural framework for combustion calculations as the transient nature of the flow is resolved. In most situations, however, the flame is thinner than the LES grid, and sub-grid modeling is required to handle the turbulence-chemistry interaction [1]. Furthermore high density ratio, as observed for the studied bluff body stabilized premixed flame, increases the numerical difficulties. Following the work of Nguyen et al. [2] in which the flame is assumed to be a surface of discontinuity, a level set approach, completed with an appropriate sub-grid scale wrinkling model [3] is evaluated in this study. Numerical results of the mean flame statistics and flame dynamics are compared with experimental data, underlining the potential of this method.

References

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