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Planar Laser-Induced Fluorescence in a Turbulent Premixed Flame to analyze Large Eddy Simulation Models

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ABSTRACT

Large eddy simulations (LES), where the large-scale motions are explicitly computed, is a promising tool for numerical simulations of reactive flows which generally exhibit large coherent structures. Nevertheless, subgrid-scale models have to be developed to describe the effects of the smaller flow motions not resolved in the simulation. An experimental method is presented for validation and development of these models, based on OH-LIF imaging in a V-shaped turbulent premixed flame stabilized behind a triangular flame holder. Instantaneous flame fronts are obtained by separating fresh and hot gases (figure 1a). A subgrid-scale combustion model is investigated here using the filtered progress variable approach. The curvature of the resolved flame front (figure 1b) appears to provide a promising estimation of the unresolved flame surface density.

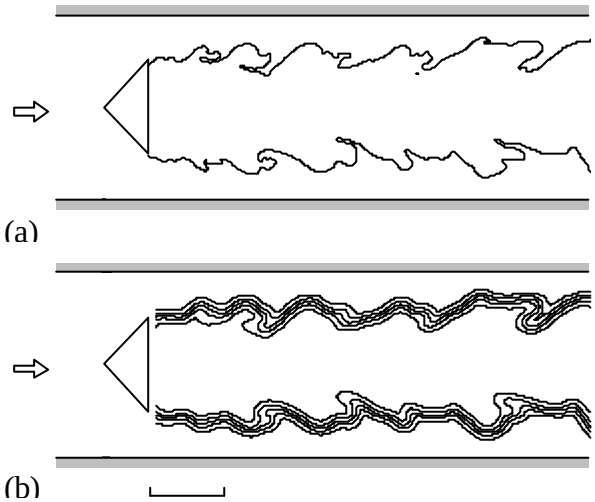

Figure 1. Visualization of the instantaneous flame front of a premixed turbulent propane/air flame stabilized behind a trianaular flame holder (a) (mean inlet