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Large Eddy Simulation of Piloted and Bluff-Body Diffusion Flame

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LES appears to be a promising tool for the prediction of turbulent combustion processes. Combustion instabilities come with large coherent structures which are better predicted with LES and because the larger structures are computed explicitly in LES, the zones of fresh and burnt gasses are clearly identified, and combustion-turbulence interactions are described more accurately. LES appears to be a promising tool for the prediction of turbulent combustion processes. Combustion instabilities come with large coherent structures which are better predicted with LES and the zones of fresh and burnt gasses are clearly identified so combustion-turbulence interactions is described more accurately. In this paper results of two LES-simulations are presented and compared to the RANS-solutions and experimental results. The test cases are a piloted CH_4/air diffusion flame and a bluff-body burner with a central fuel jet of $50\%H_2/50\%CH_4$ by volume which intensively mixes in the recirculation zone with the co-flow of air. The combustion model implemented is the mixed-is-burnt model assuming infinitely fast chemistry. The structure of the diffusion flame is fully determined once the mixture fraction Z is known. To account for the turbulence a presumed pdf approach is used with a β-shaped probability density function determined by the mixture fraction and its variance.

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