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# Experimental analysis of flamelet models for premixed turbulent combustion

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Flamelet models are now widely used to predict turbulent premixed combustion because they allow theseparation of chemical features from the description of the turbulent flow field. Some of them introduce a flame surface density (flame surface per unit volume) modelled either by an algebraic closure (Bray-Moss-Libby model) or from a transport equation. This equation may be exactly written but needs closure assumptions. In the present work, a two-dimensional turbulent premixed propane-air V flame is studied. Velocity profiles are obtained from laser-Doppler velocimetry. Flame front visualizations are achieved by tomography with high-speed cinematography using a copper vapor laser. Images are then processed to extract flame front characteristics (flame surface density, vector normal to the flame front, curvature). The Bray-Moss-Libby model is found to have a good trend but needs a precise closure of the flame wrinkling length scale. Then some terms of the exact transport equation for flame surface density are examined. A simple model is proposed to close the strain rate term acting on the flame surface and due to the mean flow. Curvature and propagation terms are found to act as a source

term on the fresh gases side and as a consumption term on the burnt one. This fact points out a lack in the generally used closures of the flame surface density equation where the propagation term is neglected and the curvature term modelled as a destruction one.

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