

Peters, N.

A spectral closure for premixed turbulent combustion in the flamelet regime. (English)

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This paper describes premixed turbulent combustion in the flamelet regime by means of a field equation. This includes the laminar burning vector and the Markstein length as characteristic length scale for the flame thickness. The scalar field function $\mathcal{G}(x, t)$ plays a role for premixed flamelets to the mixture function in nonpremixed flamelet combustion. Equations for the mean and variance of \mathcal{G} are derived. Dimensional analysis leads to a closure of the main source term in the equation for the mean. For plane normal and oblique flames, the turbulent burning velocity and flame shape are calculated. The flame brush thickness is of the order of the integral length scale, and in the case of a V-shaped flame its increase with downstream position is calculated.

Reviewer: B.F.Gray (Sydney)

MSC:

76V05 Reaction effects in flows
76F05 Isotropic turbulence; homogeneous turbulence
80A25 Combustion
37N99 Applications of dynamical systems

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plane flames; dimensional analysis; field equation; Markstein length; burning velocity; flame shape; V-shaped flame

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