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Effects of backround turbulence on a wrinkled flame FRANCESCO CRETA, MOSHE MATALON, University of Illinois at Urbana-Champaign — We study the propagation of a premixed flame in the wrinkled laminar flamelet regime within the context of a hydrodynamic theory, i.e., where flame thickness is considered small compared to fluid flow characteristic length scales. The flame sheet separates burnt and unburnt zones each at a given constant density. We solve a level set equation for the flame interface propagating at a flame speed modeled by flame stretch and modulated by a Markstein length and advected by the local fluid flow. The ensuing dual density pattern is fed to the Navier-Stokes equations, which provide the updated advecting velocity field. To investigate the influence of background turbulence on flame propagation, the flame is subjected to a turbulent field parameterized by its intensity and integral scale at the flame interface. To hold these parameters constant a feedback control system is implemented acting on the inflow characteristics. The local flow field affects the wrinkling of the flame and its overall propagation speed through a purely kinematic process. The influence of the chemical and diffusive processes is studied by varying functional parameters, such as Markstein length and expansion ratio. Thus, the influence of turbulence intensity and scale on the overall flame propagation is statistically determined with the additional parametric effect of each of the functional parameters and of flame curvature and strain rate.

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