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The turbulent flame speed for low-to-moderate turbulence intensities MOSHE MATALON, NAVIN FOGLA, University of Illinois at Urbana Champaign, FRANCESCO CRETA, University of Rome La Sapienza — Premixed flame propagation in two-dimensional turbulent flows is examined within the context of a hydrodynamic model. The flame is treated as a surface of density discontinuity and propagates against a turbulent flow of prescribed intensity and scale. A hybrid Navier-Stokes/interface capturing technique is used to describe the flow field throughout the entire domain and track the highly-fluctuating flame front which is allowed to attain folded conformations and form pockets of unburned gases that detach from the main flame surface and are rapidly consumed. A parametric study is conducted to examine the effects of the turbulence parameters: intensity and scale, and the combustion parameters: thermal expansion and mixture composition (or Markstein length). Markstein lengths are varied in order to span both, the Darrieus-Landau (DL) instability-free subcritical and the DL instability-affected supercritical regimes. Scaling laws for the turbulent flame speed, exhibiting explicit dependence on the system parameters, are proposed for low-to-moderate turbulence intensities.

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