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Folds and pockets in the propagation of premixed turbulent flames NAVIN FOGLA, MOSHE MATALON, University of Illinois at Urbana Champaign, FRANCESCO CRETA, University of Rome La Sapienza — We examine the propagation of premixed flames in two-dimensional turbulent flows within the context of a hydrodynamic model that treats the flame as a surface of density discontinuity using a hybrid Navier-Stokes/interface capturing technique. Employing an improved interface capturing technique, which allows the flame front to attain multivalued configurations and form pockets of unburned gas before being consumed, broadens the range of applicability of our results to include the corrugated flamelet regime ($u'/S_L > 1$) of turbulent combustion. Three regimes are identified, depending on the mixture composition, thermal expansion coefficient and turbulence intensity: a regime where, on the average, the flame brush remains planar and unaffected by the Darrieus-Landau (DL) instability, a regime where the DL effects, responsible for frequent intrusions of the flame front into the burned gas region, have a marked influence on the flame brush that remains resilient to turbulence, and a highly turbulent regime where the influences of the DL instability progressively decrease and play limited to no role on the flame propagation. Particular attention is given in this presentation to the effects of folding/pocket formation on the flame structure and dynamics.

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