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Linear stability analysis of a premixed flame with lateral shear CARLOS PANTANO, XIAOYI LU, University of Illinois at Urbana-Champaign — The hydrodynamic instability analysis of one-dimensional steady premixed planar flames, known as Darrieus-Landau, is extended to a lateral (side) uniform shear configuration. Here, in the steady planar flame, there is a transverse pressure gradient orthogonal to the density gradient and it is a situation of interest when a turbulent flame travels into a region of free-shear turbulence (such as a jet or shear layer). It is shown that the problem can be formulated analytically and a new dispersion relation can be determined. We were able to analytically solve Euler's equation (with a constant shear parameter) and obtain the growth rate of flame front perturbation. The study of the dispersion relation shows that perturbations have two types of behavior as wavenumber increases. First, for negligible shear, we recover Darrieus-Landau result. Second, as the nondimensional shear parameter increases the flame becomes more unstable initially but eventually it completely stabilizes. There is a finite range of values of shear for which the flame remains stable. Finally, for sufficiently high shear, the flame becomes unstable again. Further details will be discussed at the talk.

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