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Coherent structure dynamics during turbulence-flame interaction
EILEEN HAFFNER, MELISSA GREEN, Syracuse University, PETER HAMLINGTON, University of Colorad - Boulder, ALEXI POLUDNENKO, Naval Research Laboratory, ELAINE ORAN, University of Maryland — Several studies have been conducted to characterize the turbulence-flame interaction in reacting flows quantitatively. It has been observed that increased turbulence intensity both wrinkles and broadens the flame front throughout the preheat zone and reaction zone. In addition, previous studies showed that interaction with the flame changes the orientation of turbulent structures and and in some cases incites loss of vorticity, but the physical mechanism of this interaction was still unclear. An Eulerian analysis (Q criterion) is preformed to track structures through the flow, and to visualize the vortex transformation as it encounters the flame. This is coupled with the contours of the fuel-mass fraction, density, and pressure throughout the flame brush to provide insight into the physical interaction between turbulent structures and the flame. A complete description of the physical mechanism could provide insight into ways to design engine inlets for efficient mixing in combustion applications.

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