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Formation and properties of distributed flames ALEXEI POLUDNENKO, VADIM GAMEZO, ELAINE ORAN, Naval Research Laboratory, Washington, DC — Interaction of flames with turbulence is a ubiquitous process encountered in a wide variety of systems, ranging from terrestrial flames to thermonuclear burning fronts in supernovae. Burning can alter the turbulent field by injecting additional energy on multiple scales thereby modifying its spectral energy distribution. On the other hand, turbulence itself can have pronounced effect on the flame changing its morphology, properties, etc. In this work we present results of detailed numerical and theoretical modeling of the interaction of flames in stoichiometric methane-air and hydrogen-air mixtures with turbulence of varying intensity and spectrum. We demonstrate the transition with increasing turbulent intensity from the laminar flame to the corrugated flamelet and finally to the distributed reaction zone. The latter represents a quasi-steady-state propagating burning front in which thermal conduction and species diffusion are mediated by turbulent transport. We discuss properties of such flames and their potential implications for deflagration-to-detonation transition both in confined and unconfined systems.

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