Deflagration-to-Detonation Transition in Unconfined Media
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Deflagration-to-detonation transition (DDT) can occur in environments ranging from experimental and industrial systems on Earth to astrophysical thermonuclear supernovae explosions. In recent years, substantial progress has been made in elucidating the nature of this process in confined systems with walls, obstacles, etc. It remains unclear, however, whether a subsonic turbulent flame in an unconfined environment can undergo a DDT. We present simulations of premixed flames in stoichiometric H$_2$-air and CH$_4$-air mixtures interacting with high-intensity turbulence. These calculations demonstrate the DDT in unconfined systems unassisted by shocks or obstacles. We discuss the mechanism of this process and its implications.