

Abstract Submitted
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Deflagration-to-Detonation Transition in Unconfined Media

ALEXEI POLUDNENKO, Naval Research Laboratory, THOMAS GARDINER, Sandia National Laboratories, ELAINE ORAN, Naval Research Laboratory — 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 H₂-air and CH₄-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.

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