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DNS of spherically expanding turbulent premixed flames in homogeneous isotropic turbulence FABRIZIO BISETTI, TEJAS KULKARNI, University of Texas at Austin, ROMAIN BUTTAY, STEFANO LUCA, King Abdullah University of Science and Technology, ANTONIO ATTILI, RWTH Aachen University — Spherically expanding turbulent flames of lean methane air premixed mixture are studied at elevated pressures and temperatures. A methane/air mixture with an equivalence ratio of 0.7 is considered at 4 atm with an unburnt temperature of 800 K. Direct numerical simulations of spherically expanding flames in decaying homogeneous isotropic turbulence are conducted. The simulations have Reynolds numbers based on the Taylor microscale varying between 60 and 90 and grids with up to 8 billion points. The observed enhancement of the burning rate is linked to the increase in flame surface area through turbulent wrinkling. The Surface Density Function formalism is used to quantify the evolution of the flame surface area. Specifically, the role of turbulent stretching on surface generation and that of diffusion on destruction are assessed.

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