
	Dissipation and dilatation rates in premixed turbulent flames
	Physics of Fluids 33, 035112 (2021); https://doi.org/10.1063/5.0039101
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	Velocity dilatation and total, solenoidal, and dilatational dissipation rates of the total flow kinetic energy are extracted from three different direct numerical simulation databases obtained by three independent research groups using different numerical codes and methods (e.g., single-step chemistry and complex chemistry flames) from six different premixed turbulent flames associated with flamelet, thin reaction zone, and broken reaction zone regimes of turbulent burning. The results show that dilatational dissipation can be larger than solenoidal dissipation in the flamelet regime and is substantial in the thin reaction zone regime. Accordingly, the influence of combustion-induced thermal expansion on the dissipation rate is not reduced to an increase in the mixture viscosity by the temperature. A simple criterion for identifying conditions associated with significant dilatational dissipation is discussed, and dilatational dissipation due to the influence of turbulence on mixing in preheat zones is argued to play a role even at high Karlovitz numbers Ka. In particular, the magnitude of dilatation fluctuations and probability of finding negative local dilatation are increased by Ka, thus implying that the impact of molecular transport of species and heat on the dilatation increases with increasing Karlovitz number.