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Log-Normality and Multifractal Analysis of Flame Surface Statistics ABHISHEK SAHA, SWETAPROVO CHAUDHURI[1], CHUNG K. LAW, Princeton University — The turbulent flame surface is typically highly wrinkled and folded at a multitude of scales controlled by various flame properties. It is useful if the information contained in this complex geometry can be projected onto a simpler regular geometry for the use of spectral, wavelet or multifractal analyses. Here we investigate local flame surface statistics of turbulent flame expanding under constant pressure. First the statistics of local length ratio is experimentally obtained from high-speed Mie scattering images. For spherically expanding flame, length ratio on the measurement plane, at predefined equiangular sectors is defined as the ratio of the actual flame length to the length of a circular-arc of radius equal to the average radius of the flame. Assuming isotropic distribution of such flame segments we convolute suitable forms of the length-ratio probability distribution functions (*pdf*s) to arrive at corresponding area-ratio *pdf*s. Both the *pdf*s are found to be near log-normally distributed and shows self-similar behavior with increasing radius. Near log-normality and rather intermittent behavior of the flame-length ratio suggests similarity with dissipation rate quantities which stimulates multifractal analysis.

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