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High Karlovitz n-Alkane Premixed Flame DNS: Effects of Turbulence on the Flame Structure BRUNO SAVARD, BROCK BOBBITT, GUILLAUME BLANQUART, California Institute of Technology — The effects of turbulence on the structure of a statistically flat, slightly lean ($\phi = 0.9$), n-heptane/air premixed flame is investigated using three dimensional direct numerical simulations at a Karlovitz number close to 100. Two simulations are performed: one with unity Lewis numbers and one with non-unity Lewis numbers. The first simulation is used to investigate deviations away from the laminar flamelet structure as eddies penetrate the preheat and reaction zones. The second is to analyze the relative importance of molecular *vs* turbulent mixing and their effects on species transport. The conditional mean profiles of the species mass fraction *vs* temperature from both simulations are evaluated to assess the influence of turbulence on scalar transport. As expected, turbulent mixing and molecular mixing are of comparable magnitude and, as a result, the structure of the flame is altered. Using a method developed in a previous work, the effective Lewis numbers of the different species are identified. These effective Lewis numbers are closer to unity than their laminar value, showing the effect of turbulent mixing. Interestingly, with this change in Lewis numbers, the structure of the turbulent flame compares very favorably with that of a laminar flame.

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