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Burning velocity and flame surface area in high Karlovitz number flames SIMON LAPOINTE, Lawrence Livermore Natl Lab, LIONEL CHENG, GUILLAUME BLANQUART, California Institute of Technology — Accurate knowledge of the burning velocity of turbulent flames is of importance for many combustion devices. For low Karlovitz number flames, Damkohler proposed that the ratio of turbulent to laminar flame speed is proportional to the ratio of turbulent to laminar flame surface area. In recent DNS studies, it has been observed that Damkolher's scaling for low Karlovitz number flames still holds for high Karlovitz number flames. However, recent experimental studies have reported notable differences between global burning velocities and flame surface area measurements. In this work, the numerical and experimental results are further analyzed to explain the apparent contradiction. Emphasis is placed on identifying and quantifying potential experimental limitations at high Karlovitz numbers. More specifically, experimental flame surface measurements typically use binarized PLIF images. These images are two-dimensional and their resolution is limited by that of the PLIF system. The implications of using a two-dimensional iso-contour and the effects of the image resolution are assessed through post-processing of DNS datasets. Furthermore, the effects of integral length scale, Karlovitz number, and differential diffusion on the flame surface area are considered separately.

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