Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Investigation of Turbulent Hydrogen Premixed Flame Topologies at Different Combustion Regimes Using Computational Singular Perturbation EFSTATHIOS-ALEXANDROS TINGAS, FRANCISCO HERNANDEZ PEREZ, HONG IM, King Abdullah University of Science and Technology (KAUST) — The investigation of turbulent flames at higher Reynolds and Karlovitz numbers has been gaining research interest, due to the advances in the computational power that has facilitated the use of direct numerical simulations (DNS). One of the additional challenges associated with highly turbulent premixed flames is the difficulties in identifying the turbulent flame topologies as the flame structures become severely corrugated or even disrupted by the small scale turbulent eddies. In these conditions, the conventional methods using a scalar iso-surface may lead to uncertainties in describing the flame front dynamics. In this study, the computational singular perturbation (CSP) is utilized as an automated tool to identify the flame front topologies based on the dynamical time scales and eigenvalues. In particular, the tangential stretch rate (TSR) approach, an extended generalized method to depict the dynamics of chemical and transport processes, is used for the flame front identification. The CSP/TSR approach and tools are used to compare the flame fronts of two turbulent H2/air premixed flames and to identify their similarities/differences, from a dynamical point of view. The results for two different combustion regimes are analyzed and compared.

Efstathios-Alexandros Tingas
King Abdullah University of Science and Technology

Date submitted: 31 Jul 2017 Electronic form version 1.4