Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Tabulated Chemistry Simulations of Thermodiffusive Instabilities in Lean Premixed Hydrogen/Air Flames JASON SCHLUP, GUILLAUME BLANQUART, Caltech — Determining how unstable laminar flames transition from an initial perturbed planar flame to a cellular structure is an important step in understanding turbulent flame propagation and their physical mechanisms. While Direct Numerical Simulations of the turbulent reacting-flow equations complete with detailed chemical models would be ideal, the computational expense for such large scale simulations is prohibitive. To this end, tabulated chemistry models are used in this work to capture the important physical mechanisms of unsteady laminar flames. Two dimensional numerical simulations of lean hydrogen/air premixed flames are performed for a variety of domain sizes and grid resolutions. A one dimensional hydrogen/air flame serves as the initial profile, which is perturbed using a sinusoidal disturbance in the transverse direction. Additionally, detailed chemistry simulations are performed as a comparison metric for the tabulated chemistry results. Finally, the tabulated chemistry results are compared to experimental data of spherically expanding flames.

Jason Schlup
Caltech

Date submitted: 01 Aug 2014 Electronic form version 1.4