Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

DNS of a turbulent, self-igniting n-dodecane / air jet GIULIO BORGHESI, JACQUELINE CHEN, Sandia National Laboratories, Livermore, CA — A direct numerical simulation of a turbulent, self-igniting temporal jet between n-dodecane and diluted air at p=25 bar has been conducted to clarify certain aspects of diesel engine combustion. The thermodynamics conditions were selected to result in a two-stage ignition event, in which low- and high-temperature chemical reactions play an equally important role during the ignition process. Jet parameters were tuned to yield a target ignition Damkohler number of 0.4, a value representative of conditions found in diesel spray flames. Chemical reactions were described by a 35-species reduced mechanism, including both the low- and high-temperature reaction pathways of n-dodecane. The present work focuses on the influence of low-temperature chemistry on the overall ignition transient. We also study the structure of the flames formed at the end of the autoignition transient. Recent studies on diluted dimethyl ether / air flames at pressure and temperature conditions similar to those investigated in this work revealed the existence of tetra- and penta-brachial flames, and it is of interest to determine whether similar flame structures also exist when diesel-like fuels are used.

Giulio Borghesi
Sandia National Laboratories

Date submitted: 31 Jul 2016 Electronic form version 1.4