Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Physics-Based vs. Data-Driven Modeling for Turbulence and Combustion SHARATH GIRIMAJI[1], Ocean and Aerospace Engineering, Texas AM University — Honoring Ted O'Brien: Ted O'Brien had a long and distinguished career in modeling and computing chemically reacting turbulent flows. He made important contributions toward modeling/computation of auto-ignition in turbulent mixtures, conditional scalar dissipation, PDF (probability density function) methods and mapping closure methods. Currently, drive toward use of data-driven models is pervasive in nearly all fields involving complex phenomena including turbulent combustion. This presentation will discuss some of the benefits and challenges of using data-driven models for prediction of reacting turbulent flows. For a variety of turbulence and combustion features, we will compare the strengths and weaknesses of data-driven modeling against that of physics-based modeling. Specifically we will examine the general capabilities of data-driven approaches for handling (i) distant interactions - specifically non-local effects due to the elliptic nature of pressure and (ii) purely local process of chemical reactions. The talk will conclude with some recommendations on synergistically combining physics-based and data-driven approaches for developing predictive tools for turbulence and combustion.

[1]This paper is being submitted to: Session 31.5 (Honoring Ted O'Brien)

Sharath Girimaji
Ocean and Aerospace Engineering, Texas A
M University

Date submitted: 02 Aug 2019 Electronic form version 1.4