Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Reduced Order Modeling of Combustion Instability in a Gas Turbine Model Combustor NICHOLAS ARNOLD-MEDABALIMI, CHENG HUANG, KARTHIK DURAISAMY, Univ of Michigan - Ann Arbor — Hydrocarbon fuel based propulsion systems are expected to remain relevant in aerospace vehicles for the foreseeable future. Design of these devices is complicated by combustion instabilities. The capability to model and predict these effects at reduced computational cost is a requirement for both design and control of these devices. This work focuses on computational studies on a dual swirl model gas turbine combustor in the context of reduced order model development. Full fidelity simulations are performed utilizing URANS and Hybrid RANS-LES with finite rate chemistry. Following this, data decomposition techniques are used to extract a reduced basis representation of the unsteady flow field. These bases are first used to identify sensor locations to guide experimental interrogations and controller feedback. Following this, initial results on developing a control-oriented reduced order model (ROM) will be presented. The capability of the ROM will be further assessed based on different operating conditions and geometric configurations.

Nicholas Arnold-Medabalimi
Univ of Michigan - Ann Arbor

Date submitted: 01 Aug 2017 Electronic form version 1.4