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Three dimensional dynamic mode decomposition of premixed turbulent jet flames TEMISTOCLE GRENGA, JONATHAN MACART, MICHAEL MUELLER, Princeton University — Analysis of turbulent combustion DNS data largely focuses on statistical analyses. However, turbulent combustion is highly unsteady and dynamic. In this work, Dynamic Mode Decomposition (DMD) will be explored as a tool for dynamic analysis of turbulent combustion DNS data, specifically a series of low Mach number spatially-evolving turbulent planar premixed hydrogen/air jet flames. DMD decomposes data into coherent modes with corresponding growth rates and oscillatory frequencies. The method identifies structures unbiased by energy so is particularly well suited to exploring dynamic processes at scales smaller than the largest, energy-containing scales of the flow and that may not be co-located in space and time. The focus of this work will be on both the physical insights that can potentially be derived from DMD modes and the computational issues associated with applying DMD to large three-dimensional DNS datasets.

Temistocle Grenga
Princeton University

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