Abstract Submitted
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Development of Reduced-order Models for Feedback Control of Axisymmetric Jets[1] ANIRUDDHA SINHA, ANDREA SERRANI, MO SAMIMY, Ohio State University — We present the preliminary steps toward development of reduced-order models (ROM) for feedback control of a high-speed and high Reynolds number axisymmetric jet. The control objective is two-fold: attenuation of far-field acoustic radiation, or, enhancement of bulk mixing, using a set of localized arc filament plasma actuators that perturb the initial shear layer of the jet through intense localized Joule heating. The proposed feedback sensing mechanism involves pressure information from the irrotational near-field of the jet. The proposed route for creating the ROM involves collecting PIV data of the jet simultaneously with the pressure measurements, performing Proper Orthogonal Decomposition and Stochastic Estimation to obtain a time- and space-resolved database, and using Galerkin Projection to derive the dynamical model. Here we evaluate the above strategy using a DNS database (Freund, J. B., J. Fluid Mech., 438, 2001, 277–305). The ROMs obtained using various modeling options are simulated and their comparative fidelity are adjudged based on the original simulation results.

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Mo Samimy
Ohio State University

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