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Reduced-order modeling of wavepackets in controlled jets with corrugated profiles ANIRUDDHA SINHA, California Institute of Technology, ALI UZUN, Florida State University, TIM COLONIUS, California Institute of Technology — Reduced noise from high-speed turbulent jets has been achieved through passive and active devices distributed uniformly around the nozzle lip. These devices include chevrons as well as a spinning valve fluidic injection actuator that can deliver steady or harmonic excitation. On a time-averaged basis, all these actuators introduce corrugations in the mean shear layer, and our analysis shows that such corrugations give rise to new instability mechanisms in addition to the usual Kelvin-Helmholtz modes. We study these controlled jets using parallel-flow linear stability analysis, as well as the theory of linear parabolized stability equations (PSE) that accounts for mild streamwise variations of the mean flow. For unforced (round) subsonic and supersonic jets, PSE models have previously been shown to give accurate predictions for the large-scale coherent structures (wavepackets) educed from experimental data. We examine similar data for forced jets, as well as jets issuing from serrated nozzles, and seek to explain the observed modifications in wavepacket dynamics and the reduced noise radiation as changes in the instability characteristics of the corrugated mean flows.

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