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The Dynamics of Coherent Structures in Under-expanded Supersonic Impinging Jets[1] PAUL STEGEMAN, Monash University, ANDREW OOI, The University of Melbourne, JULIO SORIA, Monash University — This study looks at the spatio-temporal dynamics of the coherent structures found in under-expanded supersonic impinging jets from a circular nozzle at a pressure ratio of 3.4 and standoff distances of $\{1d, 2d, 3d\}$. In these jets the development of coherent structures within the shear layer and their interaction with a standoff-shock are the principle components of a fundamental non-linear acoustic feedback mechanism. Temporally resolved and phase averaged data for each case was generated from a three dimensional hybrid large-eddy simulation on a non-uniform structured cylindrical grid with computational domains consisting of approximately 8.6, 10.6 and 12.8 million nodes for each of the cases respectively. From these datasets we investigate the development of the energy distribution and topology of the coherent structures as a function of their distance traveled along the shear-layer from their initial growth period to their interaction with the standoff-shock wave. Furthering this analysis the various terms in the kinetic and internal energy transport equations are examined to gain insight into the physical mechanisms for the transfer of energy to/from the coherent structures.

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