Abstract Submitted
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Time-resolved tomographic PIV measurements of a turbulent shear layer flow impinging on a cavity trailing corner.[1] JOSE MORETO, XIAOFENG LIU, San Diego State University — Time-resolved tomographic PIV measurement results of three-dimensional velocity and pressure fields for a turbulent shear layer flow over an open cavity at a Reynolds number of 40,000 will be presented. The objective of the research is to investigate the pressure-related turbulence transport phenomena, with a focus on the characterization of the intercomponent turbulence fluctuation energy transfer carried out by the pressure–rate-of-strain tensor in both the shear layer and the impingement regions around the cavity trailing corner. A total of 152,000 tomo-PIV images at a sample rate of 4496 frames per second has been acquired at each measurement station. The pressure is reconstructed from the measured pressure gradient using the parallel ray omni-directional integration method. To ensure the quality of the measurements, the curl-free property of the pressure gradient is used to examine the quality of the measured pressure gradient, and the continuity equation is used to examine the quality of the velocity measurement. The quality of the measured pressure-related terms is also cross-checked with the balance of the Reynolds stress transport budget. With the evaluation of the three-dimensional pressure-related turbulence transport terms enabled by the tomo-PIV measurements, the conjectures raised by Liu and Katz (2018, https://doi.org/10.2514/1.J056168) regarding the magnitude of the spanwise intercomponent energy transfer based on their planar PIV data will be verified.

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