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Time-resolved tomographic PIV measurements of a turbulent shear layer flow past an open cavity[1] JOSE MORETO, San Diego State University; University of California, San Diego, XIAOFENG LIU, San Diego State University — Characterization of the pressure-related turbulence terms including pressure–rate-of-strain, pressure diffusion and velocity–pressure-gradient tensor in the Reynolds stress transport equation in canonical turbulent flows is of critical importance for calibrating and improving turbulence models for RANS (Reynolds-Averaged Navier Stokes) based flow simulation. Recent work of Liu and Katz (2018) based on planar-PIV shows the complex nature of the pressure related terms and their substantial impact on the dynamics of turbulence transport throughout a shear layer flow past an open cavity. They also demonstrate the need for a full three-dimensional characterization of the pressure-related turbulence transport terms around the cavity trailing corner. To address this need, time-resolved tomographic PIV measurements of the 3D pressure-related terms in the Reynolds stress transport budget for a turbulent shear layer past a cavity is being carried out. The curl-free property of the pressure gradient is used to control the quality of the measured pressure gradient, and the continuity equation is used to control the quality of the velocity measurement. The incoming flow quality is fully characterized so as to facilitate CFD simulation. Detailed velocity and Reynolds stress profiles and turbulence spectrum at selected locations, as well as preliminary tomo-PIV data of the flow field just above the cavity trailing corner, will be presented.

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