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3D reconstruction and velocity fields of a flame JONATHON PENDLEBURY, DALE TREE, TADD TRUSCOTT, Brigham Young University —
We present three-dimensional internal velocity and shape measurements of an axi-symmetric partially premixed natural gas diffusion flame using Synthetic Aperture particle image velocimetry (SAPIV). This is the first step in demonstrating the technique for fully turbulent premixed flames. It has been shown that there is significant 3-dimensional motion in turbulent flames and knowing the internal fluid structures of flames is vital to understanding the flame properties. For example, fluid strain is directly related to flame extinction and recent measurements are showing strain is related to regions of soot formation and oxidation. Thus, the 3D strain velocity field and strain tensor are needed to both understand flame physics and validate flame theory and models. The current state of the art in flame imaging is Stereoscopic-PIV (2D-3C). Alternatively, SAPIV allows the complete time resolved 3D reconstruction of a measurement volume. The technique refocuses multi-camera viewpoints (8-10) into a refocused image at several depths within a scene, reconstructing a focal stack of images for each time step.

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