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Time-resolved PIV investigation of flashback in stratified swirl flames of hydrogen-rich fuel[1] RAKESH RANJAN, NOEL CLEMENS, The University of Texas at Austin — Hydrogen is one of the promising alternative fuels to achieve greener power generation. However, susceptibility of flashback in swirl flames of hydrogen-rich fuels acts as a major barrier to its adoption in gas turbine combustors. The current study seeks to understand the flow-flame interaction during the flashback of the hydrogen-rich flame in stratified conditions. Flashback experiments are conducted with a model combustor equipped with an axial swirler and a center-body. Fuel is injected in the main swirl flow via the fuel ports on the swirler vanes. To achieve mean radial stratification, these fuel ports are located at a radial location closer to the outer wall of the mixing tube. Stratification in the flow is assessed by employing Anisole PLIF imaging. Flashback is triggered by a rapid increase in the global equivalence ratio. The upstream propagation of the flame is investigated by employing time-resolved stereoscopic PIV and chemiluminescence imaging. Stratification leads to substantially different flame propagation behavior as well as increased flame surface wrinkling.

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