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Instabilities in a Turning Reacting Mixing Layer Undergoing Transition WILLIAM SIRIGNANO, FELIX CHENG, FENG LIU, University of California, Irvine — Mixing layers composed of fuel and oxidizer streams passing through curved channels are studied by performing 2-D numerical simulations. The flows are subjected to either transverse acceleration or both transverse and streamwise accelerations. In this study, we focus on the initial development of the mixing layers from laminar to transition. The full Navier- Stokes equations coupled with multiple species equations and chemical reactions are solved using a finite-difference numerical scheme. No turbulence model is employed since the flow is fully deterministic. The mixing layers going through the curved channel are subjected to three types of instability; they are the Kelvin-Helmholtz (K-H), the centrifugal, and the Rayleigh-Taylor (R-T) instabilities. Our previous study showed that the K-H instability associated with a streamwise favorable pressure gradient produced a strain field that resulted in tearing and extinction of the flame. In the present study, we focus on the combined effects of the K-H, the centrifugal, and the R-T instabilities on the flame structures and the development of the mixing layer. Grid independence is maintained to ensure the accuracy of the numerical solutions.

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