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Flow Structure and Stability in Confined, Reacting, Bluff Body Wakes BENJAMIN EMERSON, Georgia Institute of Technology — This paper describes the variation of reacting bluff body wake structure with flame density ratio for a variety of bluff bodies and lip velocities. Previous experiments and computations have shown that the bluff body flow structures at "high" and "low" flame density ratios are fundamentally different, being dominated by the convectively unstable shear layers and absolutely unstable Von Karman vortex street, respectively. This paper characterizes the transition between these two flow structures, and shows that the bifurcation behavior does not occur abruptly at some density ratio. Rather, there exists a range of transitional density ratios at which the flow exists intermittently in both states. The fraction of time that the flow spends in either state is a monotonic function of density ratio. This paper also shows that local parallel stability analyses developed for confined, variable density, laminar base wake flows captures the qualitative behavior of this transition, demonstrating a successful parameterization of this phenomenon. These results have important implications on the dynamics of high Reynolds number, vitiated, reacting flows, suggesting that such flows exhibit two co-existing dynamical states, intermittently jumping between the two.

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