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Global Stability Analysis of Jet Diffusion Flames D. MORENO-BOZA, W. COENEN, A. SEVILLA, A.L. SÁNCHEZ, Dept. Ingeniería Térmica y de Fluidos, Universidad Carlos III de Madrid, Leganés 28911, Spain — This work investigates the global stability of axisymmetric laminar jet diffusion flames at moderately large Reynolds numbers, including effects of buoyancy, temperature increase due to chemical reaction and air coflow. The ultimate objective is to clarify the two different types of instabilities observed in experiments, as well as the connection of these instabilities with the phenomenon of diffusion-flame flickering. Quasi-isobaric conditions corresponding to low-Mach-number jets are considered and stability results regarding hot and light jets are also described. The limit of infinitely fast chemical reaction is used in the development, which assumes also a unity value of the fuel Lewis number, thereby enabling a simplified description of the temperature and composition fields in terms of a single mixture-fraction variable. A finite-element method is developed to integrate the steady equations of continuity, momentum and mixture fraction, which determine the basic steady flame structure as well as the associated perturbed equations that determine its 2D global stability.

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