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**Scaling of velocity and mixture fraction fields in laminar counterflow configurations** FABRIZIO BISETTI, King Abdullah University of Science and Technology, Saudi Arabia, GIANFRANCO SCRIBANO, University of Nottingham Malaysia Campus, Malaysia — Counterflow configurations are widely used to characterize premixed, nonpremixed, and partially premixed laminar flames. We performed a systematic analysis of the velocity and mixture fraction fields in the counterflow configuration and obtained scaling laws, which depend on two suitable nondimensional numbers: (i) the Reynolds number based on the bulk velocity $U$ and half the separation distance between the nozzles $L$, and (ii) the ratio of the separation distance $H = 2L$ to the nozzle diameter $D$. Our study combines velocity measurements via Particle Image Velocimetry, detailed two-dimensional simulations including the nozzle geometry, and an exhaustive analysis of the data based on the nondimensional numbers. The flow field is shown to be moderately sensitive to the Reynolds number and strongly affected by the ratio $H/D$. By describing the self-similar behavior of the flow field in counterflow configurations comprehensively, our results provide a systematic explanation of existing burner designs as well as clear guidelines for the design of counterflows for pressurized nonpremixed flames. Finally, questions related to the limitations of one-dimensional models for counterflows are addressed conclusively.

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