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A computational method for the solution of the edge flame velocity eigenvalue as a two-dimensional boundary value problem with applications to realistic heat release KAI-PIN LIAO, MOSHE MATALON, CARLOS PANTANO, University of Illinois at Urbana-Champaign — We present a new numerical method to determine the edge flame velocity in a counterflow as an eigenvalue of the two-dimensional boundary-value problem for the variable density equations in the zero Mach number limit. The method utilizes a collocated arrangement of all variables in space and relies on discrete mass conservation using centered second-order accurate finite-differences. The finite element method approach, weak form, is adopted to determine the discretization near boundary and ensure well-posedness of the equations. Pressure and velocities are coupled and solved iteratively, while energy and species equations are segregated and solved sequentially. The method is coupled with pseudo-arc length continuation to explore the full parametric dependence of the solution. The edge-flame velocity and structure under the combined effect of strain and heat release will be presented.

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