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Surface Tension of Premixed Flames as Gasdynamic Discontinuities: Principle and Quantitative Evaluation[1] HANNES DIRKS, ANDREAS G. CLASS, CHRISTIAN BRUZZESE, Karlsruhe Institute of Technology, Germany — Viewed on hydrodynamic length scales, a typical premixed laminar flame is thin and can be described as a gasdynamic discontinuity separating the fresh mixture from the burned products. We perform an integral momentum analysis of cylindrical premixed flames viewed as gasdynamic discontinuities and quantitatively investigate the jump of momentum at the surface of discontinuity. We interpret the jump of momentum as the result of a localised force and compute the surface tension of the surface of discontinuity, exploiting numerical data and detailed chemical kinetics. Surface tension of premixed flames is shown to be negative. Therefore, in order to establish a stable flame more stringent conditions must be satisfied than one would expect from a pure consideration of the flame speed relation. For numerical simulations, we suggest an implementation based on distributions that implicitly satisfies the momentum balance.

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Andreas G. Class
Karlsruhe Institute of Technology, Germany

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