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An investigation of streaklike instabilities in laminar boundary layer flames COLIN MILLER, Univ of Maryland-College Park, MARK FINNEY, JASON FORTHOFER, SARA MCALLISTER, Missoula Fire Sciences Laboratory, MICHAEL GOLLNER, Univ of Maryland-College Park — Observations of coherent structures in boundary layer flames, particularly wildland fires, motivated an investigation on flame instabilities within a boundary layer. This experimental study examined streaklike structures in a stationary diffusion flame stabilized within a laminar boundary layer. Flame streaks were found to align with pre-existing velocity perturbations, enabling stabilization of these coherent structures. Thermocouple measurements were used to quantify streamwise amplification of flame streaks. Temperature mapping indicated a temperature rise in the flame streaks, while the region in between these streaks, the trough, decreased in temperature. The heat flux to the surface was measured with a total heat flux gauge, and the heat flux below the troughs was found to be higher at all measurement locations. This was likely a function of the flame standoff distance, and indicated that the flame streaks were acting to modify the spanwise distribution of heat flux. Instabilities in boundary layer combustion can have an effect on the spanwise distribution of heat transfer. This finding has significant implications for boundary layer combustion, indicating that instantaneous properties can vary significantly in a three-dimensional flow field.

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