1023-35-1082 **Amy B. Moore*** (amybethmoore@yahoo.com), 17C Kensington Circle, Mount Pleasant, MI 48858, and **Milan Miklavcic**. *Diffusion Flame Stability.*

We analyze the solutions of a boundary value problem arising from a one-dimensional diffusion flame. It has been well established that the steady state solutions form an S-curve when no radiative heat losses are included. We show that this S-curve transforms into an island shaped curve and an ignition branch for large activation temperatures when radiation is included, but islands never form for low activation temperatures. We also analyze the stability of the steady state solutions by analyzing the eigenvalues of the linearized system. The evolution of stable oscillations is seen for certain parameter values by perturbing steady state solutions. Hopf bifurcation points are identified and classified as subcritical or supercritical and the regions in which small perturbations lead to stable oscillations are analyzed. A method for easily determining whether a Hopf bifurcation point of a general system of differential equations is subcritical or supercritical is developed. The method is used to more accurately identify the regions in which stable periodic solutions exist in diffusion flames. (Received September 25, 2006)