Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Infleunce of External Noise on Flame Dynamics YEVGENII RASTIGEJEV, Harvard University, MOSHE MATALON, Northwestern University — The evolution of hydrodynamically unstable flames has been studied within a hydrodynamic theory, where the flame is confined to a surface separating the fresh mixture from the hot products. The present study is based on the weakly-nonlinear Michelson-Sivashinsky (MS) equation, obtained in the limit of small values of thermal expansion. With periodic boundary conditions the MS equation possesses exact solutions, known as "pole solutions," which are cusp-like structures that propagate with a constant speed. A stable pole solution exists for any domain size, which must therefore be obtained as the long-time behavior of the equation when integrated numerically for arbitrary initial conditions. Computations show that this is indeed the case in domains of moderate size. In large domains, although a cusp-like structure develops on the average, small random-like subwrinkles appear sporadically on the flame propagating along its surface and affecting its speed. The intensity of this phenomenon is found highly sensitive to the level of numerical noise: the appearance of wrinkles is reduced or even eliminated with lower noise, and is increased with increasing the level of noise. It is concluded that the secondary structures that appear on the flame surface during its propagation are a peculiar response to background noise, numerical or physical, amplified by the hydrodynamic instability. This behavior is not only peculiar to the MS equation, but also exists when no restriction is placed on the density contrast.

Moshe Matalon
Northwestern University

Date submitted: 12 Aug 2005

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