Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Non linear dynamics of flame cusps: from experiments to modeling CHRISTOPHE ALMARCHA[1], BASILE RADISSON, ELIAS AL-SARRAF, JOEL QUINARD, EMMANUEL VILLERMAUX, BRUNO DENET, Aix-Marseille Univ., IRPHE, UMR 7342 CNRS, Centrale Marseille, Technopole de Chteau Gombert, 49 rue F. Joliot Curie, 13384 Marseille Cedex 13, France, GUY JOULIN, Institut P-prime, UPR 3346 CNRS, ENSMA, Universit de Poitiers, 1 rue clment Ader, B.P. 40109, 86961 Futuroscope Cedex, Poitiers, France — The propagation of premixed flames in a medium initially at rest exhibits the appearance and competition of elementary local singularities called cusps. We investigate this problem both experimentally and numerically. An analytical solution of the two-dimensional Michelson Sivashinsky equation is obtained as a composition of pole solutions, which is compared with experimental flames fronts propagating between glass plates separated by a thin gap width. We demonstrate that the front dynamics can be reproduced numerically with a good accuracy, from the linear stages of destabilization to its late time evolution, using this model-equation. In particular, the model accounts for the experimentally observed steady distribution of distances between cusps, which is well-described by a one-parameter Gamma distribution, reflecting the aggregation type of interaction between the cusps. A modification of the Michelson Sivashinsky equation taking into account gravity allows to reproduce some other special features of these fronts.

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Date submitted: 01 Aug 2016 Electronic form version 1.4