

Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

The dynamics of cellular two-dimensional flames CHRISTOPHE ALMARCHA, JOEL QUINARD, BRUNO DENET, ELIAS AL-SARRAF, Aix Marseille Université, CNRS, Centrale Marseille, IRPHE UMR 7342, 13384, JEAN-MARIE LAUGIER, Aix Marseille Université, CNRS, PIIM UMR 7345, 13397, Marseille, France, EMMANUEL VILLERMAUX, Aix Marseille Université, CNRS, Centrale Marseille, IRPHE UMR 7342, 13384 — Premixed flames propagating in an initially quiescent medium undergo hydrodynamic instabilities that corrugate their shape, leading to non stationary cells. The shape of a flame is a critical issue as it rules its speed or the presence of incomplete reaction zones. We report here on experiments of premixed propane-air and methane-air flames freely propagating in a vertically oriented Hele-Shaw cell. In such configuration, the quasi two dimensional flames are easy to study by image analysis thanks to a high speed camera. The dynamics is favorably compared to numerical simulations of Michelson-Sivashinsky equation. The cell size distribution is analyzed and seems to be self similar whatever the gas mixture composition, provided that the dynamics is sufficiently rich, ie the flame is sufficiently unstable. We propose an explanation for this distribution.

Christophe Almarcha
Aix Marseille Université, CNRS, Centrale Marseille,
IRPHE UMR 7342, 13384

Date submitted: 30 Jul 2014

Electronic form version 1.4