

Abstract Submitted  
for the DFD14 Meeting of  
The American Physical Society

**Influence of flame-induced vorticity on acoustic wave generation**

MATHIEU BLANCHARD, LadHyX - Ecole Polytechnique, PETER SCHMID, Department of Mathematics - Imperial College, DENIS SIPP, ONERA - Meudon, THIERRY SCHULLER, EM2C - Ecole Centrale Paris — An unsteady laminar premixed M-flame is examined using a linearized direct numerical simulation of a reactive compressible flow around a steady baseflow. Its response to a periodic acoustic forcing is considered. It is shown that the flame wrinkling process is associated with the generation and convection of vorticity waves. The impact of this vorticity on the upstream flow is examined. It is shown that vorticity waves have a strong impact on the flame tip dynamics. Results from optimal forcing computations are presented to illustrate this phenomenon. A simplified model equation, capturing the essential features of sound wave generation from vorticity, is then developed and analyzed. In particular, the impact of flame-induced unsteady vorticity on the generation of acoustic radiation at flame tip is emphasized.

Mathieu Blanchard  
LadHyX - Ecole Polytechnique

Date submitted: 31 Jul 2014

Electronic form version 1.4