Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

**Global stability of gravitationally stretched capillary jets**[1] MARIANO RUBIO-RUBIO, ALEJANDRO SEVILLA, Departamento de Ingeniería Térmica y de Fluidos, Universidad Carlos III de Madrid, Spain, JOSÉ MANUEL GORDILLO, Departamento de Ingeniería Aeroespacial y Mecánica de Fluidos, Universidad de Sevilla, Spain — We analyze the global linear stability of capillary jets stretched by gravity both experimentally and theoretically, extending the work by Sauter & Buggisch (J. Fluid Mech. vol. 533, 2005, pp. 237-257). Our results reveal the essential stabilizing role played by the axial curvature of the jet, the latter effect being especially relevant for injectors with a large diameter. The theoretical description, based on the one-dimensional mass and momentum equations retaining the exact expression for the interfacial curvature, accurately predicts the onset of jet self-excited oscillations experimentally observed for wide ranges of liquid viscosity and injector diameter. The marginal self-sustained oscillations observed in the experiments are shown to correspond to the excitation of the leading global mode of the jet. The model developed in the present work shows better agreement with the experimental jetting-dripping transition events than those available in the literature, thus allowing us to conclude that, surprisingly, the size of the steady threads produced at a given distance from the exit can be reduced by increasing the nozzle diameter. The proposed formulation allows to describe the inviscid limit, and experiments are being performed to study this distinguished case.

[1]Supported by Spanish MINECO under projects DPI 2011-28356-C03-01 and DPI 2011-28356-C03-02.

Mariano Rubio-Rubio
Departamento de Ingeniería Térmica y de Fluidos,
Universidad Carlos III de Madrid, Spain

Date submitted: 30 Jul 2013 Electronic form version 1.4