Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

**Instabilities of plumes driven by localized heating in a stably stratified ambient**[1] FRANCISCO MARQUES, Univ Politecnica de Catalunya, JUAN LOPEZ, Arizona State Univ — Plumes due to localized buoyancy sources are of wide interest due to their prevalence in many geophysical situations. This study investigates the transition from laminar to turbulent dynamics. Several experiments have reported that this transition is sensitive to external perturbations. As such, a well-controlled set-up has been chosen for our numerical study, consisting of a localized heat source at the bottom of an enclosed cylinder whose sidewall is maintained at a fixed temperature which varies linearly up the wall, and there is a localized heat source on the bottom. Restrincting the dynamics to the axisymmetric subspace, the first instability is to a puffing state. However, for smaller Grashof numbers, the plume becomes unstable to 3D perturbations and a swirling plume spontaneously appear. Further bifurcations observed in the rotating frame where the plume is stationary also exibits puffing, suggesting a connection between the unstable axisymmetric solution and the swirling plume. Further bifurcations result in quasiperiodic states with a very low frequency modulation, that eventually become turbulent.

[1]Spanish Ministry of Education and Science grant (with FEDER funds) FIS2013-40880 and U.S. National Science Foundation grant CBET-1336410

Francisco Marques
Univ Politecnica de Catalunya

Date submitted: 30 Jul 2014 Electronic form version 1.4