Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Oscillatory vortex formation behind a movable plat MARIJA VUKICEVIC, GIANNI PEDRIZZETTI, University of Trieste — INTRODUCTION: A wide spectra of application, from industrial to environmental and biological, involve fluid-structure interaction (FSI) at a fundamental level. We investigate a 2D FSI problem for a rigid structure hinged on a wall, freely rotating by the action of an oscillatory fluid flow. METHODS: The Navier-Stokes equations are solved simultaneously with the body dynamics. An accurate numerical solution is developed on the conformal map of the time-varying physical domain. RESULTS: The FSI is primarily influenced by the vortex formation process and by the interaction between vortices generated during the sequential flow oscillations. The emerging bodies can be arranged into a three main groups. The first, made of heavy bodies, terminates the motion during the first few oscillations with the impact of the body on the wall. On the other extreme, the third group made of relatively light bodies presents a flow-driven motion that oscillates periodically in time. In a wide intermediate range, the body oscillates in time presenting non periodic features. CONCLUSIONS: The process of oscillatory vortex formation in presence of fluid-structure interaction shows the emergence of various phenomena that were analyzed in details. In this specific application the results demonstrate that the FSI range from linear to chaotic interaction and finite-time collapse.

Marija Vukicevic
University of Trieste

Date submitted: 22 Jul 2010 Electronic form version 1.4