Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

**Energy extraction from a low Reynolds-number-flow using vortex-induced vibrations and optimal control** PHILIPPE MELIGA, Ecole Polytechnique Federale de Lausanne - Lab. of Fluid Mechanics and Instabilities, JEAN-MARC CHOMAZ, LadHyX-Ecole Polytechnique - CNRS — The present work investigates the dynamics of a spring-mounted circular cylinder by focusing on the amount of energy that can be extracted from the flow when an appropriate forcing is applied, which is of practical interest when vortex-induced vibrations are thought to be used for energy production. The analysis relies on an asymptotic model developed at low Reynolds numbers, herein extended to encompass the effect of the forcing. In practice, we consider the case of an actuator prescribing a small, periodical blowing and suction velocity at the cylinder wall. We vary the structural damping and natural frequency of the cylinder, and characterize the dynamics of the forced, nonlinear limit cycles. We then evidence that the magnitude of extracted energy can be maximized using the framework of the optimal control theory, which relies on an iterative algorithm based on the repeated computation of adjoint fields. A physical interpretation for the optimal control will also be proposed, in terms of the cylinder displacement, velocity and acceleration.

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Date submitted: 02 Aug 2010 Electronic form version 1.4