Forced Oscillations of a Spring-Mounted Body by a Viscous Liquid

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In this talk, we study the periodic motions of the coupled system S , consisting of an incompressible NavierStokes fluid interacting with a structure formed by a rigid body subject to undamped elastic restoring forces and torque around its rotation axis. The motion of S is driven by the uniform flow of the liquid, far away from the body, characterized by a time-periodic velocity field, V , of frequency f. We show that the corresponding set of governing equations always possesses a time-periodic weak solution of the same frequency f, whatever f > 0, the magnitude of V and the values of physical parameters. Moreover, we show that the amplitude of linear and rotational displacement is always pointwise in time uniformly bounded by one and the same constant depending on the data, regardless of whether f is or is not close to a natural frequency of the structure. Thus, our result rules out the occurrence of resonant phenomena. This is a joint work with D. Bonheure (Université Libre de Bruxelles) and G.P. Galdi (University of Pittsburgh).