**Dynamics and Stability Analysis of Fluid Structure Interaction Problems**

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In this work, we investigate the dynamical behavior of non-linear thin structures interacting with fluid flows. We initially consider a 2-D model with a non-linear beam and an inviscid potential flow. Then we extend this problem to a 3-D model with a non-linear plate and a slightly compressible Darcy flow in porous media. The thin structures in both cases are modeled as the top boundary of the fluid domain and described by coupled non-linear momentum equations for the axial and transverse displacements. For each model, we first analyze the stability of the associated dynamical non-linear structure problem and then explore the fluid structure interaction problem. In particular, we show that, for a class of boundary conditions and given inlet velocity flow for the fluid, there exists an appropriate energy norm for the fluid-structure coupled system bounded by the flux of mass through the accessible boundary and the initial data.