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A quasi-one-dimensional model for collapsible channel oscillations DRAGA PIHLER-PUZOVIC, TIMOTHY PEDLEY — A fluid driven rapidly through a flexible tube exhibits self-excited oscillations. To model this phenomenon, we consider 2D high Re laminar flow of a Newtonian incompressible fluid through a collapsible channel. The channel has a section of an otherwise rigid wall replaced by a membrane with inertia, under longitudinal tension, with no bending stiffness and subject to the external pressure. Based on the analysis by Pedley and Stephanoff (*JFM*,85), membrane motion is coupled to the time-dependent behaviour of the core flow through a modified KdV equation. We focus on the importance of membrane inertia for the system. The stability of the problem is studied numerically. In the parameter regimes of interest the computations reveal transitional behaviour: initially small perturbation of the system decays in an oscillatory manner but beyond a certain time higher frequency oscillations start dominating and the system diverges. At the same time a switching between mode one in which the flexible wall has a single extremum, to higher modes with multiple extrema is observed. These results are discussed with respect to previous computations for 2D collapsible channels.

Timothy Pedley

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