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The motion of a fluid in an open channel

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Abstract. We consider a free boundary value problem for a viscous, incompressible fluid contained in an uncovered three-dimensional rectangular channel, with gravity and surface tension, governed by the Navier-Stokes equations. We obtain existence results for the linear and nonlinear time-dependent problem. We analyse the qualitative behavior of the flow using tools of bifurcation theory. The main result is a Hopf bifurcation theorem with \mathbb{Z}_k -symmetry.

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