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Finite-amplitude solutions in rotating Hagen-Poiseuille flow[1]
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— While the pipe Poiseuille base flow is linearly stable at all Reynolds numbers, a small amount of rotation of the pipe around its axis induces linear instability beyond a low critical Reynolds number $R_c \simeq 83$ [Pedley, J. Fluid Mech. 1969]. More recently [Fernandez-Feria and del Pino, Phys. Fluids 2002], this configuration has been shown to become absolutely unstable at Reynolds numbers of the same order of magnitude. Using direct numerical simulations, we investigate here finite-amplitude solutions resulting from saturation of exponentially growing small-amplitude initial perturbations. The base flow depends on two dynamical parameters (axial Reynolds number and rotation rate) and the initial perturbation is characterized by its axial wavenumber and its azimuthal mode number. The range of nonlinear waves prevailing in this configuration, the associated nonlinear dispersion relation and the spatial structure of these solutions are systematically obtained by exploring the parameter space.

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