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Designing a simple rheometer: Unsteady dam-break flows of power-law fluids LAURA CHILDS, ANDREW J. HOGG, University of Bristol — Many geophysical flows, such as mud slides, debris flows and avalanches, are non-Newtonian, and consequently exhibit complex flow behaviour. This is often due to an underlying microstructure within the flow – for example, a suspension of particles within an interstitial fluid. We develop a method for determining the rheological parameters of a power-law fluid through the utilization of both numerical results and data from simple laboratory experiments. The model employed describes an unsteady dam-break flow of a viscous material within a rectangular channel, capturing the shape of the free surface and the streamwise velocity; a novel feature of this work is that it accounts for the effect of the containing side walls of a channel of any specified dimensions. Much of the previous work in this area has neglected this aspect of the physics, but here it can be shown that the side walls have an appreciable influence on the flow. The method relies on the numerical calculation of the flux through a cross-section of the channel, which has been done using both a finite element solver and a pseudo-spectral method, coupled to an evolution equation along the axis of the channel. Results from laboratory experiments will be shown in order to demonstrate the application, and effectiveness, of the method.

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