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Finite and Infinite Width Stokes Layers in a Power-Law Fluid
STEPHEN WILSON, DAVID PRITCHARD, CATRIONA MCARDLE, University of Strathclyde — Self-similar solutions for the oscillatory boundary layer (the "Stokes layer") in a semi-infinite power-law fluid bounded by an oscillating wall (the so-called Stokes problem) are obtained and analysed. These semi-analytical solutions differ qualitatively from the classical solution for a Newtonian fluid, both in the non-sinusoidal form of the velocity oscillations and in the manner at which their amplitude decays with distance from the wall. In particular, for shear-thickening fluids the velocity reaches zero at a finite distance from the wall, and for shear-thinning fluids it decays algebraically with distance, in contrast to the exponential decay for a Newtonian fluid. We demonstrate numerically that these self-similar solutions provide a good approximation to the flow driven by a sinusoidally oscillating wall. Further details can be found in the recent paper by D. Pritchard, C. R. McArdle and S. K. Wilson entitled "The Stokes boundary layer for a power-law fluid," in *Journal of Non-Newtonian Fluid Mechanics* **166**, 745–753 (2011).

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