Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

The motion induced between radial extensional plates with one or both plates shrinking PATRICK WEIDMAN, ENRICO PEROCCO, University of Colorado — Flow between the radial extensional motion of parallel plates is studied when one plate stretches at rate a while the other shrinks at rate b, and also when both plates shrink. The flow is governed by the stretching ratio $\sigma = b/|a|$ and the Reynolds number $R = |a|h^2/\nu$, where h is the plate separation distance and ν is the fluid kinematic viscosity. When both plates shrink one can find solutions in the region $\sigma < -1$ from those found in the region $-1 \leq \sigma \leq 0$. This feature is not available when one plate stretches and the other shrinks, and thus σ must be varied over the region $\sigma \leq 0$. The $R = 0$ solutions and their large-R asymptotic behaviors are determined. Using two numerical techniques, no bifurcated solutions were encountered. Results are presented for upper and lower wall shear stresses, radial pressure gradients, and radial velocity profiles for these axisymmetric flows. A region of zero wall shear stress exists for stretching/shrinking plates whilst the wall shear stresses for shrinking/shrinking plates are never zero. An interesting singular limit in solution behavior as $R \to \infty$ is found for the shrinking/shrinking plate flow.

Patrick Weidman
Retired

Date submitted: 31 Jul 2015 Electronic form version 1.4