Nonlinear Stability of Asymptotic Suction

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Abstract:
Asymptotic suction velocity profile is an exact solution of the Navier-Stokes equations in half-space. The semigroup approach is used to show that evolution, determined by full Navier-Stokes equations, of initially small perturbations of the asymptotic suction velocity profile is determined by the eigenvalues of the classical Orr-Sommerfeld equation. In particular, we prove existence and decay of global smooth solutions of the Navier-Stokes equations in half-space whenever the Reynolds number and the intial perturbations are small. The usual obstacle, namely, that the corresponding linear operator contains 0 in the spectrum is removed with the use of weighted spaces.

Published in *AMS Transactions* **281**(1984),215-231, also in *IMA Preprint Series* 5, 1982.
Here is the whole article in the PDF format.

Some of my other publications in this area:

1. Stability of mean flows over an infinite flat plate, *Arch. Rational Mech. Anal.* **80**(1982), 57-69. This is a joint work with M. Williams.
2. Eigenvalues of the Orr-Sommerfeld equation in an unbounded domain, *Arch. Rational Mech. Anal.* **83**(1983), 221-228.
3. Stability for semilinear parabolic equations with noninvertible linear operator, *Pacific J. Math.* **118**(1) (1985), 199-214. Also in *IMA Preprint Series* 22, 1983.
4. Eigenvalues of the Orr-Sommerfeld Equation, *Differential and Integral Equations*, **4**(1991), 731-737.
5. INSTABILITY OF VISCOUS FLOWS OVER A SHRINKING SHEET, *Quart. Appl. Math.* **72** (2014), 363-371.