

Stability of two-fluid flow through a channel

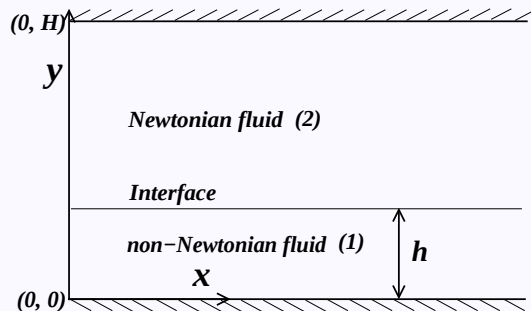
CROF Theme III. Modelling

SUB-PROJECT C: FUNDAMENTAL TRANSFER PROCESSES

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Introduction:



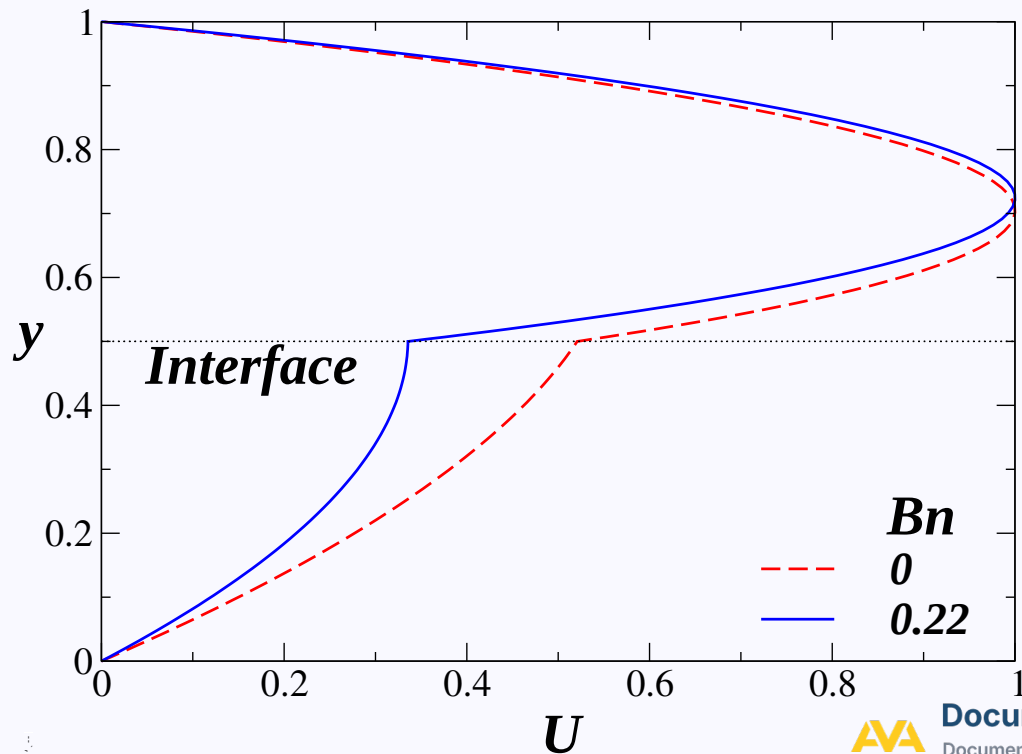
Rheological model for fluid 1:

$$\mu_1 = m \left(\frac{dU}{dy} \right)^{n-1} + Bn \left(\frac{dU}{dy} \right)^{-1}$$

Bn : Bingham number
 n : flow index

Base state: velocity profiles

$m = 10, n = 1$



$$m = 10, Bn = 0.2$$

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Linear stability analysis: Boundary conditions

- No-slip and impermeable conditions at the walls
- Continuity of velocities at the interface
- Continuity of normal and tangential stresses at the interface

An eigenvalue problem

$$A\psi = cB\psi$$

- Solved by spectral method
- Validated with several known results of Newtonian fluids e.g., South & Hooper (1999) and Yiantsios & Higgins (1988).