Report for the Short Research Visit: **Linear stability and transient behavior of viscoelastic fluids in boundary layers**

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The aim of this SRV was to perform a preliminary study on the linear stability characteristics of viscoelastic fluids in boundary layers.
We took into consideration the UCM, Oldroyd B, Phan-Thien Tanner and Giesekus models expressed as one single constitutive equation which can represent them all. These models are characterised by complicated governing equations and the application of a boundary layer approximation, as for the Newtonian and second order fluids, is not straightforward.

In order to overcome this difficulty, we assumed uniform suction at the wall and applied the Asymptotic Suction Boundary Layer (ASBL) approximation to determine the mean flow. Similarly to the Newtonian case, for the UCM and the Oldroyd B models, it is possible to obtain an analytical solution which results in an exponential profile. For the PTT and the Giesekus models, the equations simplify considerably and can be solved numerically.

The mean flow profiles can be used as a starting point for a linear stability analysis. In Figure 1, we can observe the ASBL velocity profiles and solutions for the elastic stress.

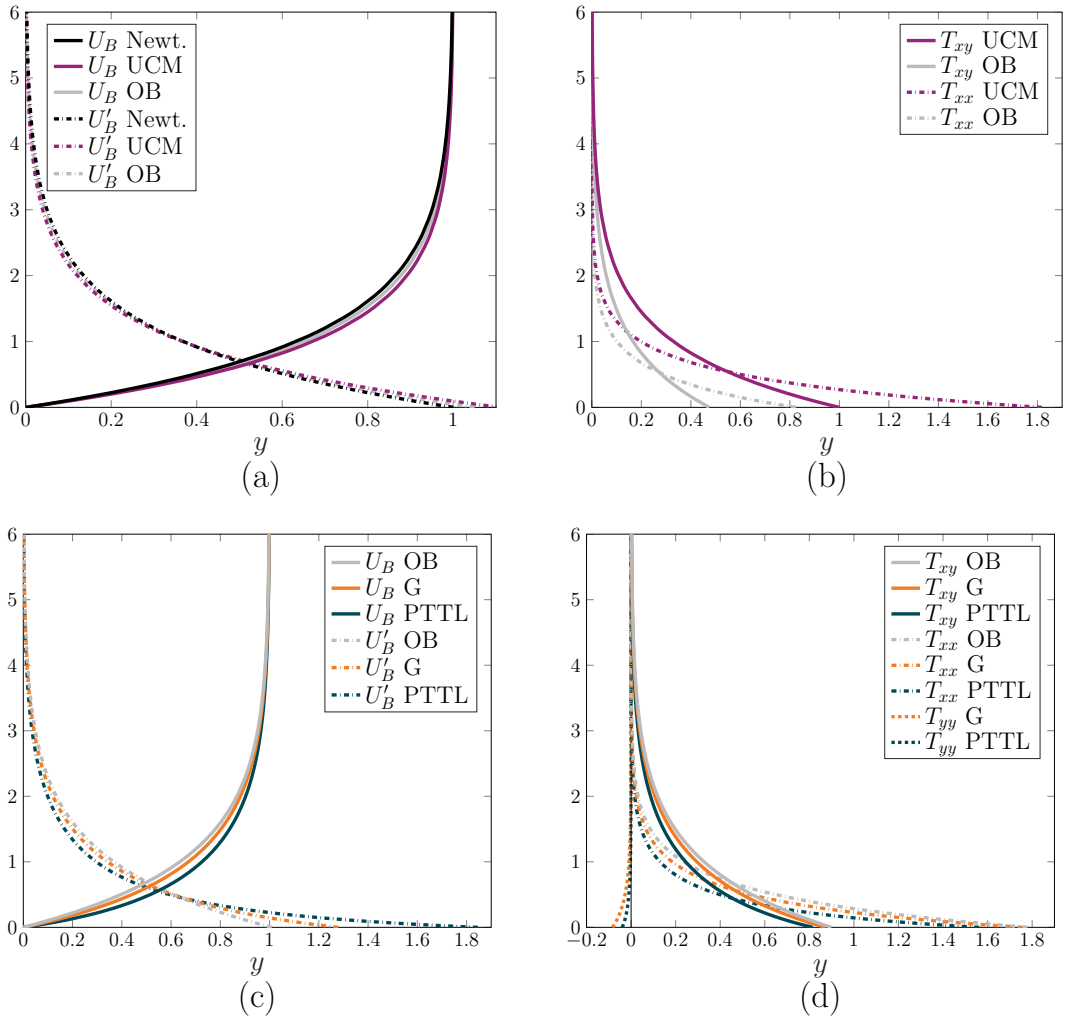

Figure 1: ASBL velocity profiles and solutions for the elastic stress. (a),(b) Newtonian, UCM with Wi =1, K = 0.1 and Oldroyd B with Wi = 1, K = 0.1, β =0.5; (c),(d) Oldroyd B with K = 0.01, Wi = 1, linear Phan-Thien Tanner with K = 0.01, Wi = 1, β = 0.1, ξ =0.05, = 0.5 and Giesekus with K = 0.01, Wi = 1, β =0.1, α = 0.1.