

Injection of a non-Newtonian fluid into a boundary-layer^{1,2}

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Overview

Funding was awarded to initiate investigations into the dynamic process of non-Newtonian fluid injection into boundary layer flows. This was a cross-SIG collaboration and has served as a basis for Griffiths' New Investigator Award proposal.

Outcome of SRV

One of the originally stated project aims is as follows: 'How will Newtonian boundary-layer flows be affected when a non-Newtonian fluid is injected at the wall?'. During the course of two visits to Cardiff progress was made in relation to the the project aim above. After discussions regarding the project as a whole and how best to address the challenging modelling problem progress was made in relation to the calculation of the basic states. The secondary project goal is as follows: 'Is it possible to promote (advantageous for the processes mentioned above) or delay boundary-layer transition, using non-Newtonian injection?'. In order to be able to investigate the stability of such flows one first needs to calculate the basic states. Progress was made in this area for injection problems involving either shear-thinning or shear-thickening fluids. These results will act as a first step in addressing the problem as a whole – funding will be sought from the EPSRC (New Investigator Award) to investigate the stability characteristics of non-Newtonian injection flows.

Griffiths presented a selection of the intermediate results at the most recent Boundary layers and complex rotating flows SIG meeting (pictured below). This proved useful as it sparked a discussion regarding the future direction of the project with inputs from experienced researchers with track records of winning EPSRC funding. He plans to present the same talk at the upcoming Non-Newtonian fluid mechanics meeting in September. Griffiths has also applied for internal funding from Coventry's Centre for Flow Measurement and Fluid Mechanics Invited Researcher Scheme that will allow Davis to visit Coventry in the near future.



Figure 1: Paul (second on the right) & Chris (first on the left) at a recent Boundary layers and complex rotating flows meeting following their final SRV.