Title: Flow of a yield stress-fluid over cavity and viscoplastic boundary layers: following the quest

Authors:  
Paul VIGNEAUX, UMPA, ENS de Lyon, France  
Guillaume CHAMBON, IRSTEA Grenoble, France  
Arthur MARLY, UMPA, ENS de Lyon, France  
Li-Hua LUU, IRSTEA Aix, France  
Pierre PHILIPPE, IRSTEA Aix, France

Contact author’s email: paul.vigneaux -at- math.cnrs.fr

Abstract:

We consider channel flows of a viscoplastic fluid over a rectangular cavity filled by the same material and present a detailed cross-comparison of experimental and numerical results based on the Herschel-Bulkley model, extending the results of [1]. In the configurations studied, the characteristic viscoplastic number $H_b$ is moderate and we study (analytically, numerically and experimentally) how the structure of the yielded viscoplastic boundary layer (captured between the dead zone in the cavity and the plug zone at the centre of the channel) is modified compared to the asymptotic situation $H_b \to \infty$ studied for instance in [2]. Interestingly, in these moderate $H_b$ configurations, one finds that the Oldroyd’ scaling of the boundary layer thickness (see [2, 3]) remains valid, provided an adaptation of the definition of $H_b$.

References:


Acknowledgements:

This work has been partially supported by CNRS through the interdisciplinary program InFiniti in 2017 and 2018.