

Boundary layer for a Non-Newtonian flow over a rough surface

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Abstract

We analyse how small irregularities of the solid surface effects the steady flow of a general viscous fluid at larger scales. In particular we consider generalised Stokes system for incompressible non-Newtonian fluids of power-law type with zero Dirichlet boundary conditions when the surface of boundary is rough. Namely, it contains microscopic surface irregularities and an amplitude, and a wavelength of oscillations is described by a small parameter which converges to zero. Our aim is to derive effective boundary conditions - a wall law - on a smoothed boundary which gives a small approximation error. To this end we study corresponding boundary layer problem. This is a result of a joint research with David Gérard-Varet.

Keywords: non-Newtonian fluids, boundary layer, rough surface, error estimate.

References

- [1] Boundary Layer for a Non-Newtonian Flow over a Rough Surface. David Gérard-Varet, A. Wróblewska-Kamińska. arXiv:1511.01252. to be published in *SIAM Journal on Mathematical Analysis*.