

## The behavior of a thin flow satisfying the slip boundary condition on a rough wall

We consider the Stokes system in a domain of small high  $\varepsilon$ . We impose the adherence condition on the top and the lateral boundary, and the slip condition on the bottom, which is assumed to be a rough periodic wall, with period  $r_\varepsilon$  and amplitude  $d_\varepsilon$ . It is assumed  $d_\varepsilon \ll r_\varepsilon \ll \varepsilon$ . We show that the behavior depends on the limit  $\lambda$  of  $d_\varepsilon\sqrt{\varepsilon}/\sqrt{r_\varepsilon^3}$ . Namely, if  $\lambda = +\infty$  the fluid behaves as if we impose the adherence condition on the bottom. If  $0 < \lambda < +\infty$ , the fluid behaves as if the bottom is flat but the friction coefficient is larger than the imposed one, and anisotropic. If  $\lambda = 0$  the fluid behaves as in the case of a flat bottom.