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The application of slip length models to larger textures in turbulent flows over superhydrophobic surfaces[1] CHRIS FAIRHALL, RICARDO GARCIA-MAYORAL, University of Cambridge — We present results from direct numerical simulations of turbulent flows over superhydrophobic surfaces. We assess the validity of simulations where the surface is modelled as homogeneous slip lengths, comparing them to simulations where the surface texture is resolved. Our results show that once the coherent flow induced by the texture is removed from the velocity fields, the remaining flow sees the surface as homogeneous. We then investigate how the overlying turbulence is modified by the presence of surface texture. For small textures, we show that turbulence is shifted closer to the wall due to the presence of slip, but otherwise remains essentially unmodified. For larger textures, the texture interacts with the turbulent lengthscales, thereby modifying the overlying turbulence. We also show that the saturation of the effect of the spanwise slip length (Fukagata et al. 2006, Busse Sandham 2012, Seo Mani 2016), which is drag increasing, is caused by the impermeability imposed at the surface.

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Chris Fairhall
University of Cambridge

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