

Sliding and Shaking - Nanoscale Surface Slip of Newtonian Fluids

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-12.15pm-
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-Abstract-

The Non-Slip Boundary Condition (NSBC) of fluid mechanics states that fluid in contact with a solid surface is stationary with respect to that surface. For the vast majority of historical experiments and applications, the NSBC has adequately described the dynamics of Newtonian fluids. In recent years, the growth of nanotechnology and microfluidics has led to a critical re-examination of this boundary condition for laminar flows. Relatively large slip has been observed in non-Newtonian fluids and using textured 'superhydrophobic' surfaces. However, we have few answers to the highly interdisciplinary scientific questions arising from recent measurements of non-zero Newtonian slip at nanometer-smooth surfaces. This topic not only addresses a centuries-old academic problem, but will become increasingly important in the foreseeable future as micro- and even nanofluidic applications become more sophisticated.

This talk will introduce the history of the slip boundary condition, which is particularly important because non-zero slip is still quantified using the slip 'length' defined by Navier in 1823. Interpretation of the slip length, which has proved difficult in the 21st Century, will be discussed. High-precision experimental investigations of slip will be introduced and the latter part of the talk will present experiments at IRL investigating Newtonian slip at a smooth, oscillating surface. In this case, the physics is quite different to other measurement methods and is directly relevant to any future devices with accelerating solid parts.

Venues

- Rankine Brown 105, Victoria University of Wellington-
- Video Conference Room, C-Block, IRL, Gracefield Site, Lower Hutt-
- Level-3 lecture theatre (A309), ELEC Dept Building, Canterbury University-
- Turitea Registry 1.07, Massey University-
- Conference Room 2, Otago University-



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