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Controlling inertia dominated flows with super-repellent surfaces

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The possibility to affect liquid flows through surface properties was naturally put forward by the recent emergence of small-scales fluidic devices, as downsizing invariably emphasizes the role of surfaces, with respect to bulk properties. Such strategy of flow modification by surface effects is *a priori* restricted to the natural scales setting the interactions between the surface and the nearby liquid that is, essentially to nanometric scales. In this context, super-repellent surfaces have emerged as possessing not only remarkable (non-)wetting properties but also unique dynamical properties. The latter manifest on their ability to promote large boundary slippage, characterized by slip lengths from 1 to hundreds of microns, that make them capable of modifying flows up such micro-scales. More fundamentally, this raises the question of how far this strategy of flow control through surfaces can be pushed, and of how deep the modification of liquid flows close to super-repellent surface is: can it persist at large scales or large velocities? After briefly going through the properties of super-repellent surfaces in laminar viscous flows, I will discuss their impact on different macro-scale experimental configurations involving inertia-dominated flows. Focusing on splashing and dripping phenomena - the latter being associated to the well-known teapot effect- I will show that although surface effects are usually ignored in such situations, in view of the large values of the Weber number, it is still possible to shape the liquid flows by tailoring surface properties, with optimized effects obtained for super-repellent surfaces.