Abstract Submitted
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Wake states and forces associated with a cylinder rolling down an incline under gravity[1] FARAH YASMINA HOUDROGE, MARK THOMPSON, KERRY HOURIGAN, FLAIR, Monash University, THOMAS LEWEKE, IRPHE, CNRS/Universités Aix-Marseille — The flow around a cylinder rolling along a wall at a constant velocity was recently investigated by Stewart et al. (JFM, 643, 648, 2010). They showed that the wake structure varies greatly as the Reynolds number was increased, and that the presence of the wall as well as the imposed motion of the body have a strong influence on the dominant wake structure and the wake transitions when the body is placed in free stream. In this work, attention is given to the flow dynamics and the fluid forces associated with a cylinder rolling down an incline under the influence of gravity. Increasing the inclination angle or the Reynolds number is shown to destabilize the wake flow. For a body close to neutrally buoyancy, the formation and shedding of vortices in its wake result in fluctuating forces and a final kinematic state in which the body's velocity is not constant. The non-dimensionalization of the main equations allows us to determine the essential parameters that govern the problem's dynamics. Furthermore, through numerical simulations we analyse in more detail the time-dependant fluid forces and the different structures of the wake in order to gain a better understanding of the physical mechanisms behind the motions of the fluid and the body.

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