

Planar Limits of 3D Helical Flows

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We study the limits of three-dimensional helical viscous and inviscid incompressible flows in an infinite circular pipe, with respectively no-slip and no-penetration boundary conditions, as the step approaches infinity. We show that, as the step becomes large, the three-dimensional helical flow approaches a flow, which is governed by the so-called two-and-half dimensional Navier-Stokes and two-dimensional Euler equations, respectively in the viscous and inviscid case. The step or pitch is the magnitude of the translation after rotating one full turn around the symmetry axis. This is joint work with Milton Lopes Filho (UFRJ), Dongjuan Niu (Capital Normal University, Beijing), Helena Nussenzveig Lopes (UFRJ), and Edriss Titi (Weizman Institute and Texas A&M).