

# Steady solutions with finite kinetic energy for the Navier-Stokes equations in a three-dimensional exterior domain

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## Abstract

We consider incompressible, three-dimensional Navier-Stokes flow, around a moving rigid body. The equations of motion are written with respect to a reference frame attached to the body, where the domain becomes fixed, time-independent, but such a change of frame produces new terms in the equations, related with the rotation of the solid, which difficult the analysis in exterior domains. We begin by presenting a result on existence and uniqueness of steady solutions with finite kinetic energy to this problem. The square-integrability of the velocity field is shown without resorting to methods based on the (complicated) fundamental solution of the underlying linear operator. Then, we prove, under small data assumption, the stability of such a steady solution.