

# Navier-Stokes equations with non-standard boundary conditions

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## Abstract

Stokes and Navier-Stokes equations play a central role in fluid dynamics, engineering and applied mathematics. Based on the theory of semi-groups we carried out a systematic treatment of Navier-Stokes equations with Navier-type boundary conditions or, as called them in the literature, non-standard boundary conditions on the boundary of the fluid domain. Precisely, the following aspects will be presented : First, the analyticity of the Stokes semi-group with three different types of non-standard boundary conditions. Second the study of the complex and fractional powers of the Stokes operator with these boundary conditions respectively, this is fundamental and plays an important role in the associated parabolic problem. Finally the study of the time dependent Stokes and Navier-Stokes problem.

**Keywords:** Navier-Stokes equations, boundary conditions, semi-group, Stokes operator

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