

On the stationary Navier-Stokes equations in distorted channels and pipes under the DDN boundary condition

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Abstract

We consider the steady motion of a viscous incompressible fluid in distorted channels or pipes, of finite length, modeled through the Navier-Stokes equations with mixed boundary conditions: the inflow is given by an arbitrary member of a Lions-Magenes class, and the fluid motion is subject to a directional do-nothing boundary condition (DDN) on the outlet, together with the standard no-slip assumption on the remaining walls of the domain. Existence of a weak solution to such Navier-Stokes system is proved without any restriction on the data, that is, inlet velocity and external force. Under a suitable smallness assumption on the data, we also prove the unique solvability of the boundary-value problem. This is joint work with Alessio Falocchi (Dipartimento di Matematica, Politecnico di Milano, Italy) and Gianmarco Sperone (Facultad de Matemáticas, Pontificia Universidad Católica de Chile, Santiago).

Keywords: incompressible fluids, mixed boundary conditions, channels, pipes.