A connection between symmetry breaking for Sobolev minimizers and stationary Navier-Stokes flows past a circular obstacle

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Talk Abstract

Fluid flows around a symmetric obstacle generate vortices which may lead to symmetry breaking of the streamlines. We study this phenomenon for planar viscous flows governed by the stationary Navier-Stokes equations with constant inhomogeneous Dirichlet boundary data in a rectangular channel containing a circular obstacle. In such (symmetric) framework, symmetry breaking is strictly related to the appearance of multiple solutions. Symmetry breaking properties of some Sobolev minimizers are studied and explicit bounds on the boundary velocity (in terms of the length and height of the channel) ensuring uniqueness are obtained after estimating some Sobolev embedding constants and constructing a suitable solenoidal extension of the boundary data. We show that, regardless of the solenoidal extension employed, such bounds converge to zero at an optimal rate as the length of the channel tends to infinity.

Keywords: symmetry breaking, fluid-structure interaction.

References

[1] F. Gazzola, G. Sperone, T. Weth, *A connection between symmetry breaking for Sobolev minimizers and stationary Navier-Stokes flows past a circular obstacle*, Appl. Math. Optim. 85, 2022, 1283-1347