The motion of a rigid body in a viscous fluid: new results for strong solutions, uniqueness and integrability properties

Filippo Palma
Università degli Studi della Campania "Luigi Vanvitelli", Dipartimento di Matematica e Fisica, Caserta, Viale Lincoln, 5, Italy.
filippo.palma@unicampania.it

Abstract

In this presentation, we introduce two novel results concerning strong solutions to the system describing the motion of a viscous fluid in interaction with a rigid body.

The framework of solutions considered corresponds to that introduced by Galdi and Silvestre [1].

Firstly, under an integrability condition on the gradient of the initial data, we demonstrate that the strong solution constructed by Galdi and Silvestre possesses the additional regularity property $u_t \in L^2(0,T;L^2(\Omega))$.

Secondly, we establish a uniqueness result: if a strong solution satisfies a further integrability condition, then it is unique. Moreover, this additional integrability requirement is automatically fulfilled when the gradient of the initial data meets the assumption that ensures the aforementioned regularity of the time derivative of the velocity field.

(Joint work with P. Maremonti)

Keywords: Rigid body-viscous fluid interaction, Navier-Stokes Equations, regularity, uniqueness.

References

[1] G.P. Galdi, A. L. Silvestre, *Strong Solutions to the Problem of Motion of a Rigid Body in a Navier-Stokes Liquid Under the Action of Prescribed*

Forces and Torques, Nonlinear Problem in Mathematical Physics and Related Topics, 2002, **I**, 121-144.

[2] P. Maremonti, F. Palma, *The motion of a rigid body in a viscous fluid: new results for strong solutions, uniqueness and integrability properties*, submitted