Thesis Project

in

Fluid Dynamics

UNIVERSITÀ DEGLI STUDI DI GENOVA

Bifurcation scenario of rotating sphere flows: a global stability analysis.

The flow over a rotating sphere is of great interest in many engineering applications, from particle transport and sedimentation processes to sports and the trajectories of spinning balls. In either case, it is extremely useful to know how rotation affects the motion of the object, which in turn requires knowledge of the forces acting on the body. The scope of this project is to investigate the stability features of rotating sphere flow and to conduct a structural sensitivity analysis in order to establish the spatial regions responsible for the generation of the instabilities. The project will be conducted using an existing numerical code solving the Navier-Stokes equations for incompressible Newtonian fluids. The main goal is to understand the effect of rotation on the flow characteristics.

A close collaboration will be maintained during the project with the Fluid Dynamics group at the Department of Industrial Engineering in Salerno.

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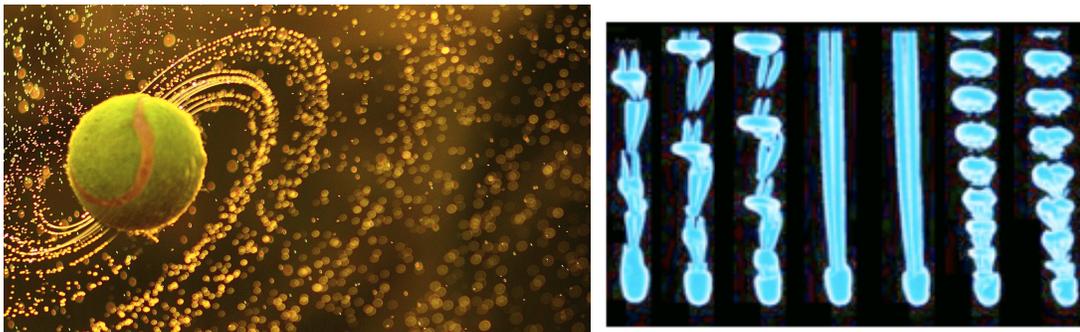

Figure 1: (left) Flow past a rotating tennis ball. (right) Example of vortical structures for several rotational speeds at Re=300.