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Small solids in an incompressible inviscid fluid

In these lectures, I will consider a simple model of evolution of solids inside a fluid. The fluid is driven by the classical incompressible Euler equation, while the solids move rigidly and evolve according to Newton's law, influenced by the pressure of the fluid on their boundary.

After the Cauchy problem for this system, the main question that I will study is the asymptotics of the solutions as the solids become small:

- in 2D, suppose that the fluid's initial datum is given and consider the corresponding solution when the solids shrink to points: what can be said about the limit?

- in 3D, still supposing the fluid datum given, what can be said when the solid is a tube shrinking to a curve?

The plan of the lectures is the following.

Course I: **Presentation of the equations**, Cauchy problem, presentation of the asymptotic problem

Course II: **Decomposition of the velocity field, asymptotics of the elementary fields, method of reflections**

Course III: **Convergences in the 2D case**

Course IV: **A result in the 3D case**