



## 复旦大学数学科学学院 数学综合报告会

报告题目: **Drag minimisation in a stationary Navier--Stokes flow using a phase field approach**

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报告地点: 光华楼东主楼 1801

**摘要:** In shape optimisation problems, the goal is to find an optimal shape that minimises some functional. One of the most studied shape optimisation problem is that of drag minimisation, that is, what is the shape of an object flowing in a fluid that gives the least drag forces. This has applications in the design of ships, racecars, wind turbines and airplane wings. Unfortunately, classical formulations of shape optimisation problems are often ill-posed, i.e., the optimal shape may not exist. In this talk, we present a mathematical formulation of the drag minimisation problem in a stationary Navier-Stokes flow. The formulation utilises a phase field approach, which leads to a well-posed optimisation problem where we can prove the existence of a minimiser. Furthermore, we can also derive first order necessary optimality conditions rigorously, and together with a gradient flow approach, we use these conditions to numerically solve for the optimal shapes of drag minimisation.

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