Aspects of the incompressible Navier-Stokes and Euler's equations

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Abstract

The Navier-Stokes equations and Eulers equation are studied from many different viewpoints. In the lectures we will focus on 2 aspects:

(a) scale-invariant solutions in 3d and their implications for general questions about the equations. This topic fits into an approach in which we aim to study individual solutions in as much detail as possible.

(b) "statistical approach to the study of 2d solutions (and also solutions of some model equations). In this approach we try to obtain conclusions about "typical behavior behavior of the solutions by studying "ensembles of solutions, rather than individual solutions, in the spirit of Statistical Mechanics. In such studies one focuses on "generic solutions and makes various "ergodicity assumptions. The conclusions from this approach can be in good agreement with the observed behavior of the solutions, even though the ergodicity assumptions are typically hard to prove or disprove. (The situation in dimension d=3 is understood much less.)