

<<湍流>>

图书基本信息

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前言

This book is primarily intended as a graduate text on turbulent flows for engineering students, but it may also be valuable to students in atmospheric sciences, applied mathematics, and physics, as well as to researchers and practicing engineers. The principal questions addressed are the following. (i) how do turbulent flows behave?

(ii) HOW can they be described quantitatively?

(iii) What are the fundamental physical processes involved?

(iv) HOW can equations be constructed to simulate or model the behavior of turbulent flows?

In 1972 Tennekes and Lumley produced a textbook that admirably addresses the first three of these questions. In the intervening years, due in part to advances in computing, great strides have been made toward providing answers to the fourth question. Approaches such as Reynolds-stress modelling, probability-density-function (PDF) methods, and large-eddy simulation (LES) have been developed that, to an extent, provide quantitative models for turbulent flows. Accordingly, here (in Part II) an emphasis is placed on understanding how model equations can be constructed to describe turbulent flows: and this objective provides focus to the first three questions mentioned above (which are addressed in Part I). However, in contrast to the book by Wilcox (1993), this text is not intended to be a practical guide to turbulence modelling. Rather, it explains the concepts and develops the mathematical tools that underlie a broad range of approaches. There is a vast literature on turbulence and turbulent flows, with many worthwhile questions addressed by many different approaches.

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内容概要

本书是一部研究生湍流教程，是以作者在Cornell大学数年的教学讲义为基础，用最新颖的观点，全面综合讲述湍流这一流体动力学的重要组成部分。

全书的内容分为两个组成部分，并且附有大量的附录，第一部分集中介绍湍流的基本知识，其工作原理，以及如何量化，也包括基本物理过程；第二部分介绍了跟湍流模型和模拟有关的各种方法；附录部分增加了理解本书所必需的数学技巧。

目次：（第一部分）基础：导引；流体运动方程；湍流的统计描述；均值流动方程；自由剪切流；湍流运动尺度；壁流；（第二部分）模型和仿真：模型和仿真引入；直接数值模拟；湍流涡粘度模型；雷诺应力及其相关模型；PDF方法；大涡模拟；（第三部分）附录。

读者对象：适用于工程运用物理专业研究生水平的学生，应用数学专业，物理，海洋学、大气科学等方向的科研人员。

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