

Preface

Turbulence plays a major role in convective heat and mass transfer. Yet an in-depth coverage of topics on turbulence structure and interactions, specifically related to their effects on transfer of heat and species, has seldom been the subject of specialized monographs or conferences proceedings.

This monograph provides recent achievements in the turbulence theory, experiments and computations, relevant to heat and mass transfer. It has been prepared in recognition of a growing interest both in fundamental issues and applications of turbulence related transport phenomena in fluids. The monograph emerged from the papers presented at the International Symposium on Turbulence, Heat and Mass Transfer, held in August, 1994, in Lisbon, under the sponsorship of the International Centre for Heat and Mass Transfer and Instituto Superior Tecnico (Technical University of Lisbon). The event was envisaged as a follow-up of the Joint ICHMT/IUTAM Symposium on Structure of Turbulence, Heat and Mass Transfer, held in Dubrovnik twelve years earlier, in 1982. Since then, many new developments and advances have been made, particularly related to the new experimental techniques, numerical simulation and modelling, as well as in the theory of turbulence, opening new prospects for understanding and resolving problems of turbulence controlled momentum, heat and mass transfer.

The volume contains 92 contributions, selected from among more than 145 papers presented at the symposium. They were chosen on the basis of originality, novelty of approach and topical relevance. All papers were reviewed and revised and many of them were completely rewritten.

The monograph covers a broad range of topics. It begins with reviews of recent advances in some key areas of current activities: similarity analysis, direct numerical and large eddy simulations, and turbulence modelling. This is followed by a series of chapters, covering specific topics. The first provides fresh experimental information on mechanical and thermal turbulence, their structures and interactions in some classic, and more exotic flow situations, as well as a few interesting analytical contributions. Recent advances in turbulence closure modelling, particularly in thermal problems are discussed in the next chapter. Subsequent sections deal with specific issues, such as impingement, separation and reattachment, turbulence related to bulk flow unsteadiness, thermal buoyancy, chemical reactions and combustion, multiphase fluids, heat and mass transfer augmentation, and applications in turbomachinery. The last chapter gives a selection of numerical computations in a variety of complex situations relevant to industrial and environmental heat and mass transfer problems.

The editors believe that the monograph will serve many readers as a source of valuable information and reference, as well as an inspiration for new advancements in the field of turbulence and related problems of heat and mass transport.

We wish to express our thanks and appreciation to the members of the Advisory Committee and Organizing Committee of the Symposium who helped in reviewing and selecting the papers. We also acknowledge the invaluable technical contribution of Ms. Sharmila Sewmar, who skillfully assisted in preparing and editing this monograph.

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