

Preface

The first Summer Program of the Center for Turbulence Research was held during the four week period July 13 to August 7, 1987. The program focused on the use of databases obtained from direct numerical simulations of turbulent flows, for study of turbulence physics and modeling.

Thirty-three participants from eight countries were selected on the basis of their research proposals. They were divided into five groups:

- Stochastic decomposition/chaos/bifurcation
- Two-point closure (or k-space) modeling
- Scalar transport/reacting flows
- Reynolds stress modeling
- Structure of turbulent boundary layers.

In addition to these participants, the program benefited from the week long participation of Robert Kraichnan and Evgeny Novikov. There were 8 tutorials and 4 seminars presented by leading experts in different areas of turbulence research.

The databases consisted of decaying and forced isotropic turbulence, homogeneous turbulence subjected to strain, homogeneous shear flow, fully developed turbulent channel flow and the turbulent boundary layer. The Reynolds numbers considered were low to moderate; Taylor micro-scale Reynolds number of about 50 in homogeneous flows and Reynolds number based on free-stream velocity and boundary layer thickness of about 3000-10000. Most simulation fields included fields of passive scalar contaminant as well as velocity.

The research reports that resulted from the 1987 summer program are included in the following pages. This is an account of a short term, but intensive, study of ideas and models of turbulent flows. Therefore, in most cases, the results should be considered as preliminary. It is expected that the studies will be continued and, in due course, the results will be submitted to the appropriate journals by the individual authors. In this volume the reports of each research group are clustered together, preceded by an overview written by the coordinator of that group.

Timely reporting of many of these projects occurred at the American Physical Society Fluid Dynamics Division Meeting in Eugene Oregon, Nov 22-24, 1987. Twenty abstracts based on the work accomplished during the summer program were presented at this meeting.

In our opinion, the Summer Program proved to be a valuable setting for exchange of conceptual ideas between participants with varied backgrounds and interests. The Summer Program demonstrated the viability of using simulation databases as a powerful tool in turbulence research, and the databases proved to be effective catalysts for interaction among turbulence researchers.

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