

# Contents

|   |     |
|---|-----|
| <b>Preface</b>  | xi  |
| Remarks on turbulence theory<br>J.-L. LIONS   | 1   |
| Hydrodynamic visualization of organized structures and<br>turbulences in boundary layers, wakes, jets<br>or propellor flows<br>H. WERLE                     | 15  |
| <b>I. Free Shear Flows</b>  | 27  |
| The emergence of characteristic (coherent?) motion in<br>homogeneous turbulent shear flows<br>D.J. CARRUTHERS, J.C.H. FUNG, J.C.R. HUNT<br>and R.J. PERKINS | 29  |
| Generation of coherent structures in free shear layers<br>P. COMTE, Y. FOUILLET, M.-A. GONZE,<br>M. LESIEUR, O. METAIS and X. NORMAND                       | 45  |
| Use of the proper orthogonal decomposition in a plane<br>turbulent mixing layer<br>J. DELVILLE, S. BELLIN and J.-P. BONNET                                  | 75  |
| On the three-dimensional dynamics of coherent structures<br>forming in free, shear flows<br>J.C. LASHERAS and E. MEIBURG                                    | 91  |
| Visualizations of helium jets in air<br>R. RIVA, G. BINDER, S. TARDU<br>and M. FAVRE-MARINET  | 113 |
| Thermal striping: structures in interacting jets<br>H.M. TSAI, D.C. LESLIE and P.R. VOKE  | 125 |
| <b>II. Boundary Layers</b>  | 139 |
| Three-dimensional aspects of the organized motion<br>in a turbulent boundary layer<br>R.A. ANTONIA and D.K. BISSET  | 141 |
| Large-eddy simulation of boundary layers with a step<br>change in pressure gradient<br>R. FRIEDRICH and F. UNGER  | 159 |

|   |     |
|---|-----|
| <b>III. Fundamentals</b>  | 175 |
| Intermittent structure of dissipation in isotropic<br>turbulence viewed from a direct simulation<br>I. HOSOKAWA and K. YAMAMOTO                               | 177 |
| The spatial structure of homogeneous turbulence at<br>Reynolds numbers around 1000<br>A. VINCENT and M. MENEGUZZI   | 191 |
| Wavelet analysis of fully developed turbulence data<br>and measurements of scaling exponents<br>E. BACRY, A. ARNEODO, U. FRISCH,<br>Y. GAGNE and E. HOPFINGER | 203 |
| How solenoidal can be the Lamb vector in turbulent<br>flow? Consequences and implications<br>A. TSINOBER  | 217 |
| <b>IV. Chaos and Instability</b>  | 225 |
| Bifurcations and bursting of streaks in the turbulent wall<br>layer<br>N. AUBRY and S. SANGHI   | 227 |
| The dynamics of organized structures in the<br>axisymmetric jet mixing layer<br>M. GLAUSER, X. ZHENG and C.R. DOERING   | 253 |
| Instability of the rectangular duct flow and generation<br>of the secondary flow<br>T. TATSUMI and T. YOSHIMURA   | 267 |
| <b>V. Vortex Breakdown</b>  | 283 |
| Vortex breakdown: a coherent transition trigger in<br>concentrated vortices<br>S. LEIBOVICH   | 285 |
| Numerical simulation of vortex breakdown via 3-D Euler<br>equations<br>P. MEGE, T.H. LE and Y. MORCHOISNE   | 303 |
| <b>VI. Two-dimensional Turbulence</b>   | 321 |
| The coherent vortices of two-dimensional and geostrophic<br>turbulence<br>J.C. McWILLIAMS   | 323 |

|  |            |
|--|------------|
| Experiments on forced, quasi-two-dimensional turbulence<br>at upwelling fronts<br>S. NARIMOUSA, T. MAXWORTHY<br>and G.R. SPEDDING                | 343        |
| Merging of two-layer baroclinic vortices<br>J. VERRON, E. HOPFINGER<br>and J.C. McWILLIAMS   | 355        |
| Transmission of acoustic waves through mixing layers<br>and 2D isotropic turbulence<br>D. JUVE, P. BLANC-BENON<br>and G. COMTE-BELLOT            | 367        |
| <b>VII. Geophysical Fluid Dynamics</b>   | <b>385</b> |
| Spectra and correlation functions of surface layer<br>atmospheric turbulence in unstable thermal<br>stratification<br>B.A. KADER and A.M. YAGLOM | 387        |
| Organized structures in strongly stratified flows<br>J.J. RILEY, M.-P. LELONG and D.N. SLINN   | 413        |
| Fossile and active turbulence<br>R.C. SANDERSON, A.D. LEONARD,<br>J.R. HERRING, and J.C. HILL  | 429        |
| Coherent structures in stratified turbulent shear flows<br>deduced from direct simulations<br>T. GERZ  | 449        |
| Influence of a shear on a stably-stratified flow<br>C. STAQUET   | 469        |
| Gravity wave patterns in the wake of a sphere in a<br>stratified fluid<br>J.M. CHOMAZ, P. BONNETON, A. BUTET,<br>E.J. HOPFINGER and M. PERRIER   | 489        |
| <b>VIII. Compressible and Reacting Flows</b>   | <b>505</b> |
| The compressible mixing layer<br>D. VANDROMME and H. HAMINH  | 507        |
| Numerical simulations of supersonic plane Couette flow<br>instability<br>N. DOLEZ and J. LEORAT  | 525        |

|   |            |
|---|------------|
| Reactive scalar as a tracer of organized structures<br>in turbulent mixing layers<br>J.-P. CHOLLET, M.-R. VALLCORBA,<br>and R. GATHMANN | 537        |
| <b>IX. MHD Turbulence</b>   | <b>551</b> |
| Large-eddy simulation of MHD turbulent channel flow<br>under a uniform magnetic field<br>Y. SHIMOMURA                                   | 553        |
| Coherent structures in MHD turbulence and turbulent<br>dynamo<br>S. YANASE, J. MIZUSHIMA and S. KIDA                                    | 569        |
| <b>List of Participants</b>   | <b>585</b> |
| <b>Author Index</b>   | <b>601</b> |
| <b>Colour Plates</b>  | <b>603</b> |