

1. Record Nr.	UNINA9910815239003321
Autore	Tardu Sedat <1959->
Titolo	Statistical approach in wall turbulence // Sedat Tardu
Pubbl/distr/stampa	London, : ISTE Hoboken, N.J., : John Wiley, 2011
ISBN	9781118601624 1118601629 9781118601587 1118601580 9781118601549 1118601548 9781299187573 1299187579
Edizione	[1st ed.]
Descrizione fisica	1 online resource (326 p.)
Collana	ISTE
Disciplina	620.1/064
Soggetti	Fluid-structure interaction - Statistical methods Turbulence - Statistical methods Boundary value problems
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Cover; Statistical Approach to Wall Turbulence; Title Page; Copyright Page; Table of Contents; Foreword; Introduction; Chapter 1. Basic Concepts; 1.1. Introduction; 1.2. Fundamental equations; 1.2.1. Euler equations; 1.3. Notation; 1.4. Reynolds averaged Navier-Stokes equations; 1.5. Basic concepts of turbulent transport mechanisms; 1.5.1. Turbulent energy transport; 1.5.2. Inter-component transport; 1.6. Correlation tensor dynamics; 1.7. Homogeneous turbulence; 1.8. Isotropic homogeneous turbulence; 1.9. Axisymmetric homogeneous turbulence; 1.10. Turbulence scales; 1.11. Taylor hypothesis 1.12. Approaches to modeling wall turbulence 1.12.1. Direct numerical simulations; 1.12.2. Measurements; Chapter 2. Preliminary Concepts: Phenomenology, Closures and Fine Structure; 2.1. Introduction; 2.2. Hydrodynamic stability and origins of wall turbulence; 2.2.1. Linear

stability; 2.2.2. Secondary stability, non-linearity and bypass transition; 2.3. Reynolds equations in internal turbulent flows; 2.4. Scales in turbulent wall flow; 2.5. Eddy viscosity closures; 2.6. Exact equations for fully developed channel flow; 2.6.1. Shear stress field; 2.6.2. Friction coefficient 2.6.3. "Laminar/turbulent" decomposition 2.7. Algebraic closures for the mixing length in internal flows; 2.8. Some illustrations using direct numerical simulations at low Reynolds numbers; 2.8.1. Turbulent intensities; 2.8.2. Fine structure; 2.8.3. Transport of turbulent kinetic energy and reformulation of the logarithmic sublayer; 2.8.4. Transport of the Reynolds shear stress -uv; 2.9. Transition to turbulence in a boundary layer on a flat plate; 2.10. Equations for the turbulent boundary layer; 2.11. Mean vorticity; 2.12. Integral equations; 2.13. Scales in a turbulent boundary layer 2.14. Power law distributions and simplified integral approach 2.15. Outer layer; 2.16. Izakson-Millikan-von Mises overlap; 2.17. Integral quantities; 2.18. Wake region; 2.19. Drag coefficient in external turbulent flows; 2.20. Asymptotic behavior close to the wall; 2.21. Coherent wall structures - a brief introduction; Chapter 3. Inner and Outer Scales: Spectral Behavior; 3.1. Introduction; 3.2. Townsend-Perry analysis in the fully-developed turbulent sublayer; 3.3. Spectral densities; 3.3.1. Longitudinal fluctuating velocity; 3.3.2. Spanwise fluctuating velocity 3.3.3. Fluctuating wall-normal velocity 3.3.4. Reynolds shear stress; 3.3.5. Summary: active and passive structures; 3.4. Clues to the Kx^{-1} behavior, and discussion; 3.5. Spectral density E_w and cospectral density E_{uv} ; 3.6. Two-dimensional spectral densities; Chapter 4. Reynolds Number-Based Effects; 4.1. Introduction; 4.2. The von Karman constant and the renormalization group; 4.2.1. Renormalization group (RNG); 4.2.2. The von Karman constant derived from the RNG; 4.3. Complete and incomplete similarity; 4.3.1. General considerations. Power law distributions 4.3.2. Implications for mixing length

Sommario/riassunto

Wall turbulence is encountered in many technological applications as well as in the atmosphere, and a detailed understanding leading to its management would have considerable beneficial consequences in many areas. A lot of inspired work by experimenters, theoreticians, engineers and mathematicians has been accomplished over recent decades on this important topic and Statistical Approach to Wall Turbulence provides an updated and integrated view on the progress made in this area. Wall turbulence is a complex phenomenon that has several industrial applications, such as in aerodynamics, turbo