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Nota di contenuto	Modeling and Simulation of Turbulent Flows; Table of Contents; Foreword; Preface; Acknowledgements; Introduction; Chapter 1. Fundamentals in Statistical Modeling: Basic Physical Concepts; 1.1. The nature of turbulence; 1.2. The various approaches to turbulence; 1.3. Homogenous and isotropic turbulence (HIT); 1.4. Kolmogorov hypotheses and the local isotropy theory; 1.5. One point closures; 1.6. Functional description of turbulence; 1.7. Turbulent diffusion and Lagrangian description; 1.8. Two-dimensional turbulence; Chapter 2. Turbulence Transport Equations for an Incompressible Fluid 2.1. General transport equations2.2. Equations specific to the main types of turbulent flows; Chapter 3. Mathematical Tools; 3.1. Tensors; 3.2. Euclidian space in curvilinear coordinates, tensor fields; 3.3. Orthogonal curvilinear coordinates; 3.4. Conformal transformation; 3.5. Invariants; 3.6. Representation of tensorial functions; 3.7. Fourier transform in the fluctuating field; 3.8. Wavelet transform; Chapter 4. Methodology for One Point Closures; 4.1. Order of magnitude estimate

of terms in the turbulence transport equations

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5.3. Rapid part of pressure correlations in the rapid distortion of isotropic turbulence5.4. Spectral models; 5.5. Turbulence associated to a passive scalar; 5.6. One point correlation equations in HAT; 5.7. Examples of anisotropic homogenous turbulent flows; 5.8. Rapid distortion theory for an homogenous turbulent flow; 5.9. Additional information on linear solutions; 5.10. Interdependency between differing closure levels: the spectral integral approach; Chapter 6. Modeling of the Reynolds Stress Transport Equations; 6.1. The Reynolds stress transport equations and their trace

6.2. Modeling viscous dissipation terms6.3. Modeling turbulent diffusion terms; 6.4. Pressure-strain correlations; 6.5. Determination of numerical constants; 6.6. The realizability of the basic models; Chapter 7. Turbulence Scales; 7.1. The turbulent kinetic energy dissipation rate equation; 7.2. Modeling of diffusive terms; 7.3. Modeling of source and sink terms; 7.4. Determination of numerical constants; 7.5. Corrective changes introduced on the dissipation equation; 7.6. Reconsidering the equation: an asymptotic behavior with finite energy?; 7.7. Tensorial volumes

7.8. Case of generation of turbulence injected at a fixed wavenumber

Sommario/riassunto

This title provides the fundamental bases for developing turbulence models on rational grounds. The main different methods of approach are considered, ranging from statistical modelling at various degrees of complexity to numerical simulations of turbulence. Each of these various methods has its own specific performances and limitations, which appear to be complementary rather than competitive. After a discussion of the basic concepts, mathematical tools and methods for closure, the book considers second order closure models. Emphasis is placed upon this approach because it embodies potentials