Buoyancy Effects In Fluids

This book develops a fundamental understanding of geophysical fluid dynamics based on a mathematical description of the flows of inhomogeneous fluids. It covers these topics: 1. development of the equations of motion for an inhomogeneous fluid 2. review of thermodynamics 3. thermodynamic and kinetic energy equations 4. equations of state for the atmosphere and the ocean, salt, and moisture effects 5. concepts of potential temperature and potential density 6. Boussinesq and quasi-geostrophic approximations 7. conservation equations for vorticity, mechanical and thermal energy instability theories, internal waves, mixing, convection, double-diffusion, stratified turbulence, fronts, intrusions, gravity currents Graduate students will be able to learn and apply the basic theory of geophysical fluid dynamics of inhomogeneous fluids on a rotating earth, including: 1. derivation of the governing equations for a stratified fluid starting from *basic principles of physics 2. review of thermodynamics, equations of state, isothermal, adiabatic, isentropic changes 3. scaling of the equations, Boussinesq approximation, applied to the ocean and the atmosphere 4. examples of stratified flows at geophysical scales, steady and unsteady motions, inertia-gravity internal waves, quasi-geostrophic theory 5. vorticity and energy conservation in stratified fluids 6.boundary layer convection in stratified containers and basins.*

Non-Newtonian (non-linear) fluids are common in nature, for example, in mud and honey, but also in many chemical, biological, food, pharmaceutical, and personal care processing industries. This Special Issue of Fluids is dedicated to the recent advances in the mathematical and physical modeling of non-linear fluids with industrial applications, especially those concerned with CFD studies. These fluids include traditional non-Newtonian fluid models, electro- or magneto-rheological fluids, granular materials, slurries, drilling fluids, *polymers, blood and other biofluids, mixtures of fluids and particles, etc. Applications of Heat, Mass and Fluid Boundary Layers brings together the latest research on boundary layers where there has been remarkable advancements in recent years. This book highlights relevant concepts and solutions to energy issues and environmental sustainability by combining fundamental theory on boundary layers with real-world industrial applications from, among others, the thermal, nuclear and chemical industries. The book's editors and their team of expert contributors discuss many core themes, including advanced heat transfer fluids and boundary layer analysis, physics of fluid motion and viscous flow, thermodynamics and transport phenomena, alongside key methods of analysis such as the Merk-Chao-Fagbenle method. This book's multidisciplinary coverage will give engineers, scientists, researchers and graduate students in the areas of heat, mass, fluid flow and transfer a thorough understanding of the technicalities, methods and* *applications of boundary layers, with a unified approach to energy, climate change and a sustainable future. Presents up-to-date research on boundary layers with very practical applications across a diverse mix of industries Includes mathematical analysis to provide detailed explanation and clarity Provides solutions to global energy issues and environmental sustainability*

This Special Issue contains articles include, but not limited to, empirical, analytical, or design-oriented approaches to the following topics: Monitoring of carrying capacity and mechanisms for managing tourist flows in rural areas; Systems and tools to measure the social, economic, and environmental sustainability of rural tourism; Integration between public tourism policies and private strategies in the promotion and implementation of sustainable practices; Policies for promoting public participation in the planning and development of sustainable rural tourism; The impacts of tourism on traditional agricultural activities; Identity enhancement of the territory *and its productions; "Good practices" in the implementation of rural tourism sustainability.*

Onset of Convection in Two Liquid Layers with Phase Change

Numerical Techniques and Insights Into Physics

Cellular Flows

Buoyant Convection in Geophysical Flows

Numerical Investigation of Momentumless Wakes in Stratified Fluids

A cell, whose spatial extent is small compared with a surrounding flow, can develop inside a vortex. Such cells, often referred to as vortex breakdown bubbles, provide stable and clean flame in combustion chambers; they also reduce the lift force of delta wings. This book analyzes cells in slow and fast, one- and two-fluid flows and describes the mechanisms of cell generation: (a) minimal energy dissipation, (b) competing forces, (c) jet entrainment, and (d) swirl decay. The book explains the vortex breakdown appearance, discusses its features, and indicates means of its control. Written in acceptable, non-math-heavy format, it stands to be a useful learning tool for engineers working with combustion chambers, chemical and biological reactors, and delta-wing designs.

"This book on an important area of applied mathematics is a compendium of the work of many pioneering authors and of research works from throughout the author's career ... It is intended to provide background for young scientists and graduate students as well as applied mathematicians and professional engineers. Some knowledge of vector calculus including the integral theorems such as Green's theorem, Stokes's theorem and divergence theorem is assumed on the part of the reader. Isotropic tensor calculus is used sparingly in some chapters. A famliarity with the Bessel functions, Legendre polynomials

and hypergeometric functions is also expected" -- Back cover.
NOTE: The Binder-ready, Loose-leaf version of this text contains the same content as the Bound, Paperback version. Fundamentals of Fluid Mechanic, 8th Edition offers comprehensive topical coverage, with varied examples and problems, application of visual component of fluid mechanics, and strong focus on effective learning. The text enables the gradual development of confidence in problem solving. The authors have designed their presentation to enable the gradual development of reader confidence in problem solving. Each important concept is introduced in easy-to-understand terms before more complicated examples are discussed. Continuing this book's tradition of extensive real-world applications, the 8th edition includes more Fluid in the News case study boxes in each chapter, new problem types, an increased number of real-world photos, and additional videos to augment the text material and help generate student interest in the topic. Example problems have been updated and numerous new photographs, figures, and graphs have been included. In addition, there are more videos designed to aid and enhance comprehension, support visualization skill building and engage students more deeply with the material and concepts.
With major implications for applied physics, engineering, and the natural and social sciences, the rapidly growing area of environmental fluid dynamics focuses on the interactions of human activities, environment, and fluid motion. A landmark for the field, the two-volume Handbook of Environmental Fluid Dynamics presents the basic principles, funda
Munson, Young and Okiishi's Fundamentals of Fluid Mechanics
With Applications to Geophysics
Stratified/rotating fluid dynamics of the atmosphere-ocean. II
Mechanics of Real Fluids
Buoyancy Effects on Natural Ventilation

Chemical Engineering and Chemical Process Technology is a theme component of

Encyclopedia of Chemical Sciences, Engineering and Technology Resources in the global Encyclopedia of Life Support Systems (EOLSS), which is an integrated compendium of twenty Encyclopedias. Chemical engineering is a branch of engineering, dealing with processes in which materials undergo changes in their physical or chemical state. These changes may concern size, energy content, composition and/or other application properties. Chemical engineering deals with many processes belonging to chemical industry or related industries (petrochemical, metallurgical, food, pharmaceutical, fine chemicals, coatings and colors, renewable raw materials, biotechnological, etc.), and finds application in manufacturing of such products as acids, alkalis, salts, fuels, fertilizers, crop protection agents, ceramics, glass, paper, colors, dyestuffs, plastics, cosmetics, vitamins and many others. It also plays significant role in environmental protection, biotechnology, nanotechnology, energy production and sustainable economical development. The Theme on Chemical Engineering and Chemical Process Technology deals, in five volumes and covers several topics such as: Fundamentals of Chemical Engineering; Unit

Operations – Fluids; Unit Operations – Solids; Chemical Reaction Engineering; Process Development, Modeling, Optimization and Control; Process Management; The Future of Chemical Engineering; Chemical Engineering Education; Main Products, which are then expanded into multiple subtopics, each as a chapter. These five volumes are aimed at the following five major target audiences: University and College students Educators, Professional practitioners, Research personnel and Policy analysts, managers, and decision makers and NGOs.

This monograph, entirely devoted to "Convection in Fluids", presents a unified rational approach of various convective phenomena in fluids (mainly considered as a thermally perfect gas or an expansible liquid), where the main driving mechanism is the buoyancy force (Archimedean thrust) or temperature-dependent surface tension in homogeneities (Marangoni effect). Also, the general mathematical formulation (for instance, in the Bénard problem - heated from below) and the effect of free surface deformation are taken into account. In the case of atmospheric thermal convection, the Coriolis force and stratification effects are also considered. This volume gives a rational and analytical analysis

of the above mentioned physical effects on the basis of the full unsteady Navier-Stokes and Fourier (NS-F) equations - for a Newtonian compressible viscous and heat-conducting fluid - coupled with the associated initials (at initial time), boundary (lower-at the solid plane) and free surface (upper-in contact with ambiant air) conditions. This, obviously, is not an easy but a necessary task if we have in mind a rational modelling process, and work within a numerically coherent simulation on a high speed computer.
An up-to-date summary of our understanding of the dynamics and thermodynamics of moist atmospheric convection, with a strong focus on recent developments in the field. The book also reviews ways in which moist convection may be parameterised in large-scale numerical models - a field in which there is still some controversy - and discusses the implications of convection for large-scale flow. Audience: The book is aimed at the graduate level and research meteorologists as well as scientists in other disciplines who need to know more about moist convection and its representation in numerical models.
This volume is a selection of the material presented at the 7th European Mixing Congress. It is concerned exclusively with

mixing in circular section vessels, using centrally mounted paddles or similar impellers. The contents are arranged under three classifications: Modelling of Mixing Processes, Mixing Operations and Experimental Techniques. The classifications result in the original material appearing in a different order to that of the Congress. This arrangement is intended to assist the reader in identifying the topic area by function or application, rather than by technology. In this book the section on Modelling contains papers which focus on the representation of the mixing process, whether by equation, scale-up criteria, or fluid dynamic simulation. Similarly, Mixing Operations are concerned with the application or function of the mixing process, such as mass transfer, heat transfer or mixing time. Experimental Techniques addresses the tools the researcher needs to use at the data gathering experimental stage. It collects together advances made in the various methods used by some of the foremost researchers, and indicates those areas still in need of additional instrumentation or methods of data reduction. The book is intended for researchers, designers and users of mixing *equipment, and for those planning research and development programmes and who wish to keep up to date with advances in the basic technology and its applications.*

Nonlinear buoyancy effects in fluids

Topological Metamorphoses in Fluid Mechanics

Buoyancy Effects in Fluids

Turbulent Fluid Motion

Heat Transfers and Related Effects in Supercritical Fluids

The dissertation focuses on a comparison between momentumless (self-propelled) and net-momentum (towed) wakes with an emphasis on the elucidation of buoyancy effects. It is difficult to realize truly momentumless wakes in the laboratory and DNS offer a viable, accurate alternative because the initial value of net momentum can be controlled and the evolution of the net momentum can be closely monitored. DNS of axisymmetric wakes with and without net momentum are performed at Re=50,000 on a grid with approximately 2 billion grid points. The development of the wake is characterized by the evolution of maxima, area integrals and spatial distributions of mean and turbulence statistics. The mean velocity in the self-propelled, momentumless wake decays more rapidly than the towed case due to higher shear and consequently a faster rate of energy transfer to turbulence. Buoyancy allows a wake to survive longer in a stratified fluid by reducing the u1'u3' correlation responsible for the mean-to-turbulence energy transfer in the vertical direction. This buoyancy effect is especially important in the self-propelled case because it allows regions of positive and negative

momentum to become decoupled in the vertical direction and decay with different rates. The vertical wake thickness is found to be larger in self-propelled wakes. The role of internal waves in the energetics is determined and it is found that they are responsible for sustaining turbulence at the wake periphery long after the shear production has subsided. The non-equilibrium region of the Re=50,000 wake is found to exhibit a time span when, although the turbulence is strongly stratified as indicated by small Froude number, the turbulent dissipation rate exhibits inertial scaling. The multiply inflected mean velocity profile, inherent to the self-propelled wake, results in four bands of vorticity, compared to the two bands observed in the towed case. Vortex pairs of opposite sign form vortex dipoles which interact with other dipoles to cause a more disordered appearance of the late wake vorticity when compared to the towed case.
In a microgravity experiment, the conditions prevalent in fluid phases can be substantially different from those on the ground and can be exploited to improve different processes. Fluid physics research in microgravity is important for the advancement of all microgravity scients: life, material, and engineering. Space flight provides a uniqu
This book investigates the unique hydrodynamics and heat transfer problems that are encountered in the vicinity of the critical point of fluids. Emphasis is given on weightlessness conditions, gravity effects and thermovibrational phenomena. Near their critical point, fluids indeed obey universal behavior and become very compressible and expandable. Their comportment, when gravity effects are suppressed, becomes quite unusual. The problems that are treated in this book are of interest to students and researchers interested in the original

behavior of near-critical fluids as well as to engineers that have to manage supercritical fluids. A special chapter is dedicated to the present knowledge of critical point phenomena. Specific data for many fluids are provided, ranging from cryogenics (hydrogen) to high temperature (water). Basic information in statistical mechanics, mathematics and measurement techniques is also included. The basic concepts of fluid mechanics are given for the non-specialists to be able to read the parts he is interested in. Asymptotic theory of heat transfer by thermoacoustic processes is provided with enough details for PhD students or researchers and engineers to begin in the field. Key spaces are described in details, with many comparisons between theory and experiments to illustrate the topics.

Fundamentals of Fluid Mechanics, 9th Edition offers comprehensive topical coverage, with varied examples and problems, application of the visual component of fluid mechanics, and a strong focus on effective learning. The authors have designed their presentation to enable the gradual development of reader confidence in problem solving. Each important concept is introduced in easy-to-understand terms before more complicated examples are discussed. The 9th Edition includes new coverage of finite control volume analysis and compressible flow, as well as a selection of new problems. Continuing this important work's tradition of extensive real-world applications, each chapter includes Fluids in the News case study boxes in each chapter. In addition, there are a wide variety of videos designed to enhance comprehension, support visualization skill building and engage students more deeply with the material and concepts.

Chemical Engineering and Chemical Process Technology

- Volume VII
Fundamentals and Analytical Expressions
Physics of Fluids in Microgravity
Buoyancy-Driven Flows
Physics and Mechanics of Primary Well Cementing

This scholarly text provides an introduction to the numerical methods used to model partial differential equations, with focus on atmospheric and oceanic flows. The book covers both the essentials of building a numerical model and the more sophisticated techniques that are now available. Finite difference methods, spectral methods, finite element method, flux-corrected methods and TVC schemes are all discussed. Throughout, the author keeps to a middle ground between the theorem-proof formalism of a mathematical text and the highly empirical approach found in some engineering publications. The book establishes a concrete link between theory and practice using an extensive range of test problems to illustrate the theoretically derived properties of various methods. From the reviews: "...the books unquestionable advantage is the clarity and simplicity in presenting virtually all basic ideas and methods of numerical analysis currently actively used in geophysical fluid dynamics." Physics of Atmosphere and Ocean

The phenomena treated in this book all depend on the action of gravity on small density differences in a non-rotating fluid. The author gives a connected account of the various motions which can be driven or influenced by buoyancy forces in a stratified fluid, including internal waves, turbulent shear flows and buoyant convection. This excellent introduction to a rapidly developing field, first published in 1973, can be used as the basis of graduate courses in university departments of meteorology, oceanography and various branches of engineering. This edition is reprinted with corrections, and extra references have been added to allow readers to bring themselves up to date on specific topics. Professor Turner is a physicist with a special interest in laboratory modelling of small-scale geophysical processes. An important feature is the superb illustration of the text with many fine photographs of laboratory experiments and natural phenomena.

This monograph covers many different aspects of materials science and in particular: inorganic (semiconductors and metal alloys) and organic (protein crystals) materials as well as the case of living biological tissues. In particular, attention is mainly devoted to the most useful and/or promising aspects of the new illuminating knowledge provided by microgravity experimentation. When microgravity conditions are attained, materials and fluids do "incredible" things. This environment (provided by space platforms or properly simulated on the ground by microscale experimentation) is instrumental in unravelling processes that are otherwise interwoven or overshadowed in "normal" gravity. It becomes possible to test fundamental theories of three-dimensional laminar, oscillatory and turbulent flow generated by various other forces; all of which are of substantial theoretical as well as practical interest on Earth. Critical knowledge gained from these experiments is accelerating the current trend towards predictable and reproducible phenomena, and enabling the development of new manufacturing methods. Within this context, this book develops and refines working engineering models, that can be easily used within practical applications, while providing a rigorous mathematical and numerical framework for deeper understanding and effective treatment of a number of macrophysical and microphysical phenomena still poorly known or ignored by most of specialists in the field of materials science. Furthermore, some unexpected theoretical kinships existing among the different subjects explored within the text (inorganic, organic, biological, etc.) are elucidated and emphasized (for instance, those dealing with the presence of moving and/or interacting interfaces). Along these lines, many problems are treated within the common framework of Volume of Fluid and Level-

Set numerical methods and other similar multiphase Eulerian or Lagrangian techniques. Large amount of information is transmitted from one field to another in terms of models and numerical strategies. Such a philosophy succeeds in building a common source for the scientific community, with the intention to establish an ongoing, mutually beneficial dialogue among a variety of fields.

We perform linear stability calculations for horizontal fluid bilayers that can undergo a phase transformation, taking into account both buoyancy effects and thermocapillary effects in the presence of a vertical temperature gradient. We compare the familiar case of the stability of two immiscible fluids in a bilayer geometry with the less-studied case that the two fluids represent different phases of a single-component material, e.g., the water-steam system. The two cases differ in their interfacial boundary conditions: the condition that the interface is a material surface is replaced by the continuity of mass flux across the interface, together with an assumption of thermodynamic equilibrium that in the linearized equations represents the Clausius-Clapeyron relation relating the interfacial temperature and pressures. For the two-phase case, we find that the entropy difference between the phases plays a crucial role in determining the stability of the system. For small values of the entropy difference between the phases, the two-phase system can be linearly unstable to either heating from above or below. The instability is due to the Marangoni effect in combination with the effects of buoyancy (for heating from below). For larger values of the entropy difference the two-phase system is unstable only for heating from below, and the Marangoni effect is masked by effects of the entropy difference. To help understand the mechanisms driving the instability on heating from below we have performed both long-wavelength and short-wavelength analyses of the two-phase system. The short-wavelength analysis shows that the instability is driven by a coupling between the flow normal to the interface and the latent heat generation at the interface. The mechanism for the large wavelength instability is more complicated, and the detailed form of the expansion is found to depend on the Crispation and Bond numbers as well as the entropy difference. The two-phase system allows a conventional Rayleigh-Taylor instability if the heavier fluid overlies the lighter fluid; applying a temperature gradient allows a stabilization of the interface.

Meteorological and Geoastrophysical Abstracts

Geophysical Fluid Dynamics

BUOYANCY EFFECTS IN FLUIDS.

Convection in Fluids

HMT: The Science & Applications of Heat and Mass Transfer. Reports, Reviews & Computer Programs

Since the 1980s, attention has increased in the research of fluid mechanics due to its wide application in industry and phycology. Major advances have occurred in the modeling of key topics such Newtonian and non-Newtonian fluids, nanoparticles, thermal management, and physiological fluid phenomena in biological systems, which have been published in this Special Issue on symmetry and fluid mechanics for Symmetry. Although, this book is not a formal textbook, it will be useful for university teachers, research students, and industrial researchers and for overcoming the difficulties that occur when considering the nonlinear governing equations. For such types of equations, obtaining an analytic or even a numerical solution is often more difficult. This book addresses this challenging job by outlining the latest techniques. In addition, the findings of the simulation are logically realistic and meet the standard of sufficient scientific value.

This book describes in depth the fundamental effects of buoyancy, a key force in driving air and transporting heat and pollutants around the interior of a building. This book is essential reading for anyone involved in the design and operation of modern sustainable, energy-efficient buildings, whether a student, researcher or practitioner. The book presents new principles in natural ventilation design and addresses surprising, little-known natural ventilation phenomena that are seldom taught in architecture or engineering schools. Despite its scientific

and applied mathematics subject, the book is written in simple language and contains no demanding mathematics, while still covering both qualitative and quantitative aspects of ventilation flow analysis. It is therefore suitable for both non-expert readers who just want to develop intuition of natural ventilation design and control (such as architects and students) and for those possessing more expertise whose work involves quantifying flows (such as engineers and building scientists).

Basic fluid dynamic theory and applications in a single, authoritative reference The growing capabilities of computational fluid dynamics and the development of laser velocimeters and other new instrumentation have made a thorough understanding of classic fluid theory and laws more critical today than ever before. Fundamentals of Fluid Mechanics is a vital repository of essential information on this crucial subject. It brings together the contributions of recognized experts from around the world to cover all of the concepts of classical fluid mechanics-from the basic properties of liquids through thermodynamics, flow theory, and gas dynamics. With answers for the practicing engineer and real-world insights for the student, it includes applications from the mechanical, civil, aerospace, chemical, and other fields. Whether used as a refresher or for first-time learning, Fundamentals of Fluid Mechanics is an important new asset for engineers and students in many different disciplines.

This book covers the major physical and mechanical processes that unfold during cementing and subsequent well service, and which can affect the well integrity.

Focusing on the underlying physics, it concisely presents the central concepts of well cementing. The authors discuss the displacement of different fluids in the annulus, the mechanical stability of cement subject to varying downhole temperature, pressure and in-situ stresses, and the impact of defects on cement integrity under different mechanical and thermal loads over the course of the well's lifetime. The book identifies knowledge gaps and unresolved issues, and proposes new directions for future research and development. The book is a valuable resource for practising engineers in the oil and gas industry, academic and industrial researchers involved in oil and gas engineering, and to graduate students within this same sector.

Turbulent Buoyant Jets and Plumes

Mixing and Dispersion in Flows Dominated by Rotation and Buoyancy

Recent Advances in Mechanics of Non-Newtonian Fluids

Symmetry and Fluid Mechanics

Convective Heat Transfer Analysis for Visco-Elastic Fluids

The Science & Applications of Heat and Mass Transfer: Reports, Reviews, & Computer Programs, Volume 6: Turbulent Buoyant Jets and Plumes focuses on the formation, properties, characteristics, and reactions of turbulent jets and plumes. The selection first offers information on the mechanics of turbulent buoyant jets and plumes and turbulent buoyant jets in shallow fluid layers. Discussions focus on submerged buoyant jets into shallow fluid, horizontal surface or interface jets into shallow layers, fundamental considerations, and turbulent buoyant jets (forced plumes). The manuscript then examines a turbulence model for buoyant flows and its application to vertical buoyant jets, including mathematical model, calculation of vertical

buoyant jets, and explanation of velocity and temperature spreading in pure jets and pure plumes. The publication is a dependable reference for scientists and readers interested in turbulent buoyant jets and plumes.

This comprehensive book is based on the Navier-Stokes and other continuum equations for fluids. It interprets the analytical and numerical solutions of the equations of fluid motion. Topics included are turbulence, and how, why, and where it occurs; mathematical apparatus used for the representation and study of turbulence; continuum equations used for the analysis of turbulence; ensemble, time, and space averages as they are applied to turbulent quantities; the closure problem of the averaged equations and possible closure schemes; Fourier analysis and the spectral form of the continuum equations, both averaged and unaveraged; nonlinear dynamics and chaos theory.

The book presents a state-of-the-art overview of current developments in the field in a way accessible to attendees coming from a variety of fields. Relevant examples are turbulence research, (environmental) fluid mechanics, lake hydrodynamics and atmospheric physics. Topics discussed range from the fundamentals of rotating and stratified flows, mixing and transport in stratified or rotating turbulence, transport in the atmospheric boundary layer, the dynamics of gravity and turbidity currents eventually with effects of background rotation or stratification, mixing in (stratified) lakes, and the Lagrangian approach in the analysis of transport processes in geophysical and environmental flows. The topics are discussed from fundamental, experimental and numerical points of view. Some contributions cover fundamental aspects including a number of the basic dynamical properties of rotating and or stratified (turbulent) flows, the mathematical description of these flows, some applications in the natural environment, and the Lagrangian statistical analysis of turbulent transport processes and turbulent transport of material particles (including, for example, inertial *and finite-size effects). Four papers are dedicated to specific topics such as transport in (stratified) lakes, transport and mixing in the atmospheric boundary layer, mixing in stratified fluids and dynamics of turbidity currents. The book is addressed to doctoral students and postdoctoral researchers, but also to academic and industrial researchers and practicing engineers, with a background in mechanical engineering, applied physics, civil engineering, applied mathematics, meteorology, physical oceanography or physical limnology.*

This book describes in depth the fundamental effects of buoyancy, a key force in driving air and transporting heat and pollutants around the interior of a building. This book is essential reading for anyone involved in the design and operation of modern sustainable, energy-efficient buildings, whether a student, researcher, or practitioner. The book presents new principles in natural ventilation design and addresses surprising, little-known natural ventilation phenomena that are seldom taught in architecture or engineering schools. Despite its scientific and applied mathematics subject, the book is written in simple language and contains no demanding mathematics, while still covering both qualitative and quantitative aspects of ventilation flow analysis. It is, therefore, suitable to both non-expert readers who just want to develop intuition of natural ventilation design and control (e.g., architects and students) and to those possessing more expertise whose work involves quantifying flows (e.g., engineers and building scientists).

Rheology - Part II

OTS.

Computational Fluid Dynamics Simulations

Handbook of Research on Advancements in Supercritical Fluids Applications for Sustainable Energy Systems

The Physics and Parameterization of Moist Atmospheric Convection

Supercritical fluids are increasingly being used in energy *conversion and fluid dynamics studies for energy-related systems and applications. These new applications are contributing to both the increase of energy efficiency as well as greenhouse gas reduction. Such research is critical for scientific advancement and industrial innovations that can support environmentally friendly strategies for sustainable energy systems. The Handbook of Research on Advancements in Supercritical Fluids Applications for Sustainable Energy Systems is a comprehensive two-volume reference that covers the most recent and challenging issues and outlooks for the applications and innovations of supercritical fluids. The book first converts basic thermo-dynamic behaviors and "abnormal" properties from a thermophysical aspect, then basic heat transfer and flow properties, recent new findings of its physical aspect and indications, chemical engineering properties, micro-nano-scale phenomena, and transient behaviors in fast and critical environments. It is ideal for engineers, energy companies, environmentalists, researchers, academicians, and students studying supercritical fluids and their applications for creating sustainable energy systems.*

This book has been written with the idea of providing the fundamentals for those who are interested in the field of heat transfer to non-Newtonian fluids. It is well recognized that non-Newtonian fluids are encountered in a number of transport processes and estimation of the heat transfer characteristics in the presence of these fluids requires analysis of equations that are far more complex than those encountered for Newtonian fluids. A deliberate effort has been made to demonstrate the methods of simplification of the complex equations and to put forth analytical expressions for the various heat transfer situations in as vivid a manner as possible. The book covers a broad range of topics from forced, natural and mixed convection without and with porous *media. Laminar as well as turbulent flow heat transfer to non-Newtonian fluids have been treated and the criterion for transition from laminar to turbulent flow for natural convection has been established. The heat transfer characteristics of non-Newtonian fluids from inelastic power-law fluids to viscoelastic second-order fluids and mildly elastic drag reducing fluids are covered. This book can serve the needs of undergraduates, graduates and industry personnel from the fields of chemical engineering, material science and engineering, mechanical engineering and polymer engineering.*

Studies of convection in geophysical flows constitute an advanced and rapidly developing area of research that is relevant to problems of the natural environment. During the last decade, significant progress has been achieved in the field as a result of both experimental studies and numerical modelling. This led to the principal revision of the widely held view on buoyancy-driven turbulent flows comprising an organised mean component with superimposed chaotic turbulence. An intermediate type of motion, represented by coherent structures, has been found to play a key role in geophysical boundary layers and in larger scale atmospheric and hydrospheric circulations driven by buoyant forcing. New aspects of the interaction between convective motions and rotation have recently been discovered and investigated. Extensive experimental data have also been collected on the role of convection in cloud dynamics and microphysics. New theoretical concepts and approaches have been outlined regarding scaling and parameterization of physical processes in buoyancy-driven geophysical flows. The book summarizes interdisciplinary studies of buoyancy effects in different media (atmosphere and hydrosphere) over a wide range of scales (small scale phenomena in unstably stratified and convectively mixed layers to deep convection in the atmosphere and ocean), by different research methods (field measurements, *laboratory simulations, numerical modelling), and within a variety of application areas (dispersion of pollutants, weather forecasting, hazardous phenomena associated with buoyant forcing).*

Ch. 1 comprises the motivation to the study, the description and the historical background of the problems considered in other chapters. Ch. 2 includes all basic definitions, the governing equations and techniques that are exploited in the rest of dissertation. In ch. 3, the natural buoyancy effect on 2nd-grade fluid along a vertical plate is analyzed. The asymptotic method in conjunction with Pade approximation, the LNS local nonsimilarity solution method and Keller Box technique are exploited to get the solution. Study of the natural buoyancy for 2nd -grade flow along a heated vertical plate with variable heat flux is considered in ch 4. The influence of dissipation term on natural buoyancy is discussed in ch. 5 for a second grade fluid along flat vertical plate. Ch 6 is mainly composed of buoyancy flow between two expanding/contracting vertical surfaces with variable temperature on both walls. Ch 7 is to analyze the natural buoyancy of second grade fluid in a deformable channel with variable heat flux at both walls. Analytic solutions of nonlinear problem arising in chapters 6 and 7 are developed by HPM. The numerical results are also obtained using method of parallel shooting."

Gravitational Effects in Fluid and Materials Science

Handbook of Environmental Fluid Dynamics, Volume Two

Fundamentals of Fluid Mechanics

Systems, Pollution, Modeling, and Measurements

Modelling, Operations and Experimental Techniques

Buoyancy is one of the main forces driving flows on our planet, especially in the oceans and atmosphere. These flows range from buoyant coastal currents to dense overflows

in the ocean, and from avalanches to volcanic pyroclastic flows on the Earth's surface. This book brings together contributions by leading world scientists to summarize our present theoretical, observational, experimental and modeling understanding of buoyancy-driven flows. Buoyancy-driven currents play a key role in the global ocean circulation and in climate variability through their impact on deep-water formation. Buoyancy-driven currents are also primarily responsible for the redistribution of fresh water throughout the world's oceans. This book is an invaluable resource for advanced students and researchers in oceanography, geophysical fluid dynamics, atmospheric science and the wider Earth sciences who need a state-of-the-art reference on buoyancy-driven flows.

A Rational Analysis and Asymptotic Modelling
Fluids, Materials and Microgravity
Fluid Mechanics of Mixing
Recent Trends in Coatings and Thin Film-Modeling and Application
Numerical Methods for Fluid Dynamics