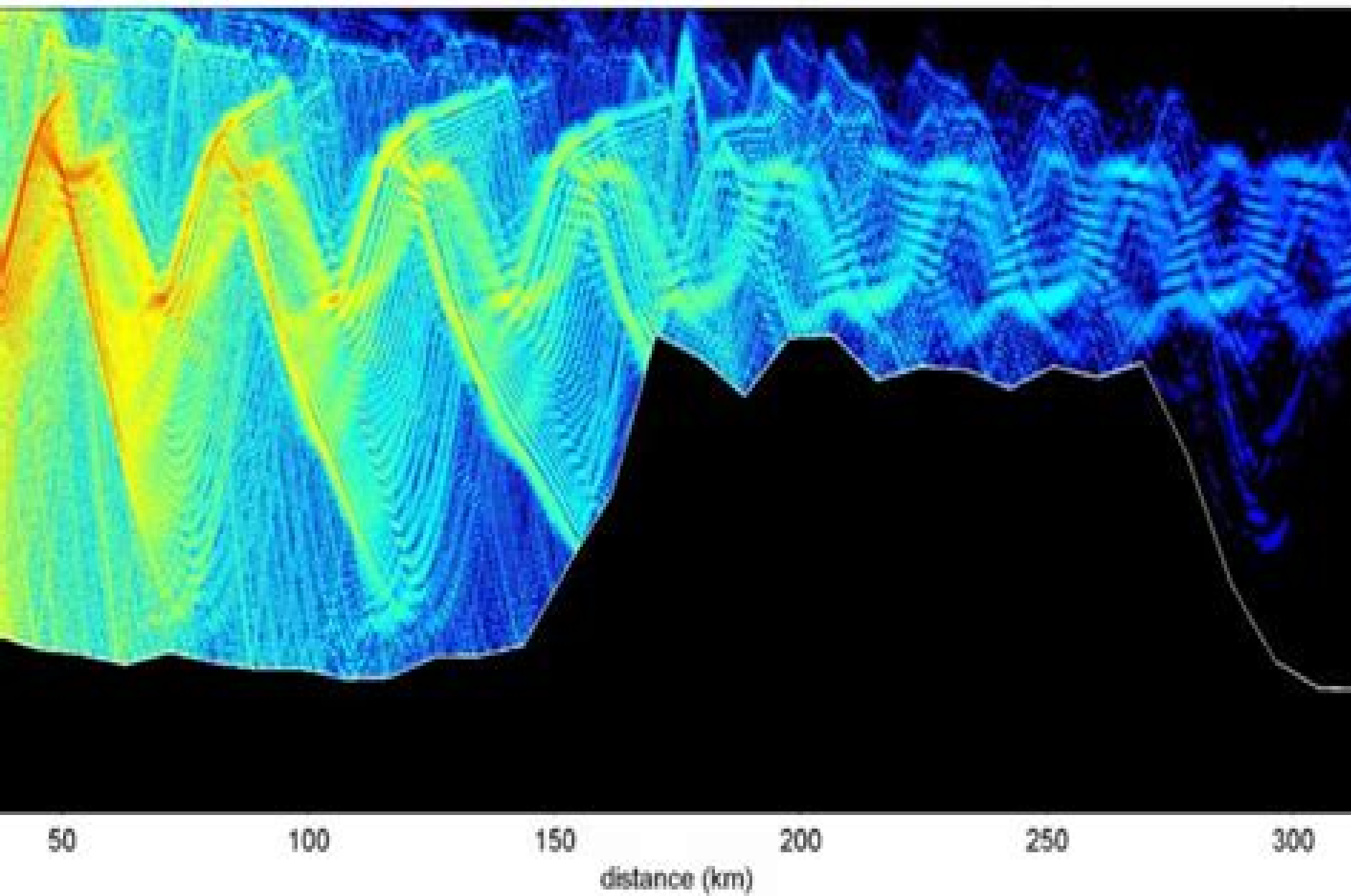


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Ocean Acoustics

Herman Medwin



Ocean Acoustics:

Computational Ocean Acoustics Finn B. Jensen, William A. Kuperman, Michael B. Porter, Henrik Schmidt, 2011-06-10
Senior level graduate level text reference presenting state of the art numerical techniques to solve the wave equation in heterogeneous fluid solid media Numerical models have become standard research tools in acoustic laboratories and thus computational acoustics is becoming an increasingly important branch of ocean acoustic science The first edition of this successful book written by the recognized leaders of the field was the first to present a comprehensive and modern introduction to computational ocean acoustics accessible to students This revision with 100 additional pages completely updates the material in the first edition and includes new models based on current research It includes problems and solutions in every chapter making the book more useful in teaching the first edition had a separate solutions manual The book is intended for graduate and advanced undergraduate students of acoustics geology and geophysics applied mathematics ocean engineering or as a reference in computational methods courses as well as professionals in these fields particularly those working in government especially Navy and industry labs engaged in the development or use of propagating models

Ocean Acoustics J.A. DeSanto, 2013-11-11 This Topics volume is devoted to a study of sound propagation in the ocean The effect of the interior of the ocean on underwater sound is analogous to the effect of a lens on light The oceanic lens is related as in light propagation to the index of refraction of the medium The latter is given by the ratio of the sound frequency to the speed of sound in water typically about 1500 m/s It is the variation of the sound speed due to changing temperature density salinity and pressure in the complex ocean environment which creates the lens effect Many oceanic processes such as currents tides eddies circulating translating regions of water and internal waves the wave like structure of the oceanic density variability contribute in turn to the changes in sound speed The net effect of the ocean lens is to trap and guide sound waves in a channel created by the lens The trapped sound can then propagate thousands of miles in this oceanic waveguide In addition to the propagation in the interior of the ocean sound can propagate into and back out of the ocean bottom as well as scatter from the ocean surface Just as the sound produced by a loudspeaker in a room is affected by the walls of the room so the ocean boundaries and the material properties below the ocean bottom are essential ingredients in the problem

Ocean Acoustics Anatoly Kistovich, Konstantin Pokazeev, Tatiana Chaplina, 2020-01-03 This book presents a comprehensive overview of hydroacoustics and describes the physical basis of acoustic processes observed in the sea In addition it discusses the basic concepts and provides simplified models of sound propagation and acoustic phenomena at the boundary between environments Lastly the book examines in detail a number of applications of ocean acoustics and methods The ocean is the last reserve of natural resources It is also an essential element in the biosphere ensuring the latter's balance and plays a pivotal role in the Earth's climate system and global warming Consequently studying the ocean is one of humankind's most critical scientific tasks but penetrating its mysteries is no mean feat Acoustics

hydroacoustics is one of the most powerful tools for examining the water layer and beyond since sound waves are the only type of radiation that can propagate over distances of hundreds and even thousands of kilometers in the ocean. This unique resource appeals to specialists working in the fields of ocean and atmosphere physics students and postgraduate students studying sea physics and oceanology and anyone who is interested in the problems the ocean is currently facing.

Sounds in the Sea Herman Medwin, 2005-07-21 Publisher Description

Fundamentals of Ocean Acoustics L.M. Brekhovskikh, Yu.P. Lysanov, 2006-04-10 This book provides an up to date introduction to the theory of sound propagation in the ocean. The text treats both ray and wave propagation and pays considerable attention to stochastic problems such as the scattering of sound at rough surfaces and random inhomogeneities. An introductory chapter that discusses the basic experimental data complements the following theoretical chapters. New material has been added throughout for this third edition. New topics covered include inter thermocline lenses and their effect on sound fields weakly divergent bundles of rays ocean acoustic tomography coupled modes sound scattering by anisotropic volume inhomogeneities with fractal spectra Voronovich's approach to sound scattering from the rough sea surface. In addition the list of references has been brought up to date and the latest experimental data have been included.

Ocean Acoustics Program J. Michael McKisic, 1981

Fundamentals of Ocean Acoustics L. Brekhovskikh, Y. Lysanov, 2013-03-14 The continents of our planet have already been exploited to a great extent. Therefore man is turning his sight to the vast spaciousness of the ocean whose resources mineral biological energetic and others are just beginning to be used. The ocean is being intensively studied. Our notions about the dynamics of ocean waters and their role in forming the Earth's climate as well as about the structure of the ocean bottom have substantially changed during the last two decades. An outstanding part in this accelerated exploration of the ocean is played by ocean acoustics. Only sound waves can propagate in water over large distances. Practically all kinds of telemetry communication location and remote sensing of water masses and the ocean bottom use sound waves. Propagating over thousands of kilometers in the ocean they bring information on earthquakes eruptions of volcanoes and distant storms. Projects using acoustical tomography systems for exploration of the ocean are presently being developed. Each of these systems will allow us to determine the three dimensional structure of water masses in regions as large as millions of square kilometers.

Understanding Ocean Acoustics Jens M. Hovem, Hefeng Dong, 2023-10-17 Underwater acoustics is important in all underwater sonar systems for object detection classification surveillance and for communications links for military and civilian purposes. Sound is also a major tool for studying the ocean environment and the interaction of sound and marine life in general. Understanding Ocean Acoustics emphasises such applications and issues relevant to studies of the ocean environment and aquatic life. Its focus is therefore environmental research and development using low frequencies relevant to fish and sea mammals. For such frequencies the geoacoustic properties of the bottom cannot be ignored which requires knowledge about waves in solids which is missing in most books on underwater acoustics.

Fundamentals of Ocean

Acoustics Leonid M. Brekhovskikh, Yury P. Lysanov, 2013-06-29 As man turns his attention from the overcrowded continents of this planet and explores the spaciousness of the ocean the applications of ocean acoustics become increasingly numerous and important This book provides an up to date introduction to the theory of sound propagation in the ocean with much new material having been added throughout the second edition It includes both ray and wave treatments and considerable attention is paid to stochastic problems such as the scattering of sound at rough surfaces and random inhomogeneities An introductory chapter that discusses the basic experimental data complements the following theoretical chapters **Ocean Acoustics** Ivan Tolstoy, Clarence S. Clay, 1987 An Introduction to Underwater Acoustics Xavier Lurton, 2002 Presented in a clear and concise way as an introductory text and practical handbook the book provides the basic physical phenomena governing underwater acoustical waves propagation reflection target backscattering and noise It covers the general features of sonar systems transducers and arrays signal processing and performance evaluation It provides an overview of today's applications presenting the working principles of the various systems From the reviews Presented in a clear and concise way as an introductory text and practical handbook the book provides the basic physical phenomena governing underwater acoustical waves propagation reflection target backscattering and noise It provides an overview of today's applications presenting the working principles of the various systems *Oceanis* Vol 27 3 4 2003 This book is a general survey of Underwater Acoustics intended to make the subject as easily accessible as possible with a clear emphasis on applications In this the author has succeeded with a wide variety of subjects presented with minimal derivation There is an emphasis on technology and on intuitive physical explanation Darrell R Jackson *Journal of the Acoustic Society of America* Vol 115 2 February 2004 This is an exciting new scientific publication It is timely and welcome Furthermore it is up to date and readable It is well researched excellently published and ranks with earlier books in this discipline Many persons in the marine science field including acousticians hydrographers oceanographers fisheries scientists engineers educators students and equipment manufacturers will benefit greatly by reading all or part of this text The author is to be congratulated on his fine contribution Stephen B MacPhee *International Hydrographic Review* Vol 4 2 2003 **Ultrasound micromanipulations and ocean acoustics: From human cells to marine structures** Zhixiong Gong, Feiyan Cai, Wei Li, Thierry Baasch, 2023-07-19 *History Of Russian Underwater Acoustics* Oleg A Godin, David R Palmer, 2008-02-01 This book describes using first person accounts the history of the development in the Soviet Union and later in Russia of an extremely important technical field and how that history was influenced by WWI WWII and the Cold War by government bureaucracy in both positive and negative ways by the economic collapse of the Soviet Union and most importantly by the dedicated efforts of vast numbers of individuals including some of the greatest scientific minds of the 20th century It will make fascinating reading for engineers and scientists who were engaged in similar work in the West for historians of the Cold War and of the Soviet Union and for present day researchers who need to learn about Russian scientific contributions

Because of its importance to national security much of the research and development effort in underwater acoustics was classified during the Cold War both in the Soviet Union and the United States This book presents the first declassified accounts of the development of numerous hydroacoustic systems by individuals having first hand knowledge of the development efforts

Ray and Wave Chaos in Ocean Acoustics Denis Makarov, 2010

1 Ray and wave propagation 1 1 Underwater sound channel 1 2 Basic equations 1 3 Geometrical optics approximations and optical mechanical analogy The Hamiltonian formalism 1 4 Ray travel times 1 5 Range dependent environments 1 6 Acoustic ocean tomography 1 7 Experiments on long range sound propagation 1 8 Summary 2 Ray chaos 2 1 Hamiltonian chaos 2 2 Lyapunov instability 2 3 Ray medium resonance 2 4 Overlapping of resonances 2 5 Vertical resonance 2 6 Manifestation of regular and chaotic ray motion in distributions of ray travel times 2 7 Summary 3 Wave chaos 3 1 The problem of wave chaos 3 2 Normal modes 3 3 Mode coupling under chaotic conditions 3 4 Influence of fine scale inhomogeneities on wave dynamics 3 5 Summary 4 Chaotic phenomena in random environment 4 1 Ray chaos in a random medium 4 2 Travel times of chaotic rays 4 3 Modal structure of the sound field in a waveguide with random inhomogeneities 4 4 Wave beam in an ocean acoustic waveguide 4 5 Arrival times of sound pulses in the presence of internal waves and a mesoscale inhomogeneity 4 6 Summary 5 Glossary of some concepts and notations in Hamiltonian chaos theory

Numerical Ocean Acoustic Propagation in Three Dimensions Ding Lee, Martin H. Schultz, 1995 This book introduces a comprehensive mathematical formulation of the three dimensional ocean acoustic propagation problem by means of functional and operator splitting techniques in conjunction with rational function approximations It presents various numerical solutions of the model equation such as finite difference alternating direction and preconditioning The detailed analysis of the concept of 3D $N \times 2D$ and 2D problems is very useful not only mathematically and physically but also computationally The inclusion of a complete detailed listing of proven computer codes which have been in use by a number of universities and research organizations worldwide makes this book a valuable reference source Advanced knowledge of numerical methods applied mathematics and ocean acoustics is not required to understand this book It is oriented toward graduate students and research scientists to use for research and application purposes

Advances In Underwater Acoustics, Structural Acoustics, And Computational Methodologies (In 4 Volumes) Sean F Wu, Steffen Marburg, 2025-04-29 This set of volumes encompasses the study of acoustics to diverse environments ranging from underwater and marine environments to structural and civil engineering computational models and aerospace engineering Each volume comprises peer reviewed publications in the related field of acoustics from the past decade arranged such as to review the existing literature examine new methodologies and then explore novel applications of pioneering acoustic principles With contributions by eminent acoustics researchers this set holds key insights for fellow acoustics researchers and engineers of any field impacted by acoustic phenomena Volume 1 s review chapters summarise theories like geoacoustic inversion as well as criticism of the Biot theory of propagation in fluid saturated porous solids while

the new methodologies shown range from an efficient and stable coupled mode solution to a cell based smoothed radial point interpolation method The book concludes with promising applications like experimental evidence of horizontal refraction and bottom attenuation coefficient inversion Volume 2 reviews topics including radiation boundary conditions for the Helmholtz equation and analytical interpretation of the early literature on the theory of vibrations The methodologies range from coupled boundary element and energy flow method as well as sound radiation of a line source The work concludes with promising applications like Lamb Waves in a poroelastic plate and experimental validations of reconstructed excitation forces acting inside a solid enclosure Volume 3 provides summaries of theories including the benchmark study on eigenfrequencies of fluid loaded structures and the Burton and Miller method while the new methodologies presented range from a coupled boundary element and energy flow method to an efficient approach to the simulation of acoustic radiation The volume concludes with promising applications like a comparison of transient infinite elements and transient Kirchhoff integral methods as well as a fast multi frequency iterative acoustic boundary element method Volume 4 depicts the context of conventional methodologies including short wave components and Galbrun s equation while its new methodologies range from radiation and outflow boundary conditions for direct computation of acoustic and flow disturbances to the effect of airfoil shape on trailing edge noise The collection concludes with promising applications like helicopter noise predictions and conservative source interpolation methods for aeroacoustics

Applied Underwater Acoustics Thomas Neighbors, David Bradley, 2017-01-19 Applied Underwater Acoustics meets the needs of scientists and engineers working in underwater acoustics and graduate students solving problems in and preparing theses on topics in underwater acoustics The book is structured to provide the basis for rapidly assimilating the essential underwater acoustic knowledge base for practical application to daily research and analysis Each chapter of the book is self supporting and focuses on a single topic and its relation to underwater acoustics The chapters start with a brief description of the topic s physical background necessary definitions and a short description of the applications along with a roadmap to the chapter The subtopics covered within individual subchapters include most frequently used equations that describe the topic Equations are not derived rather assumptions behind equations and limitations on the applications of each equation are emphasized Figures tables and illustrations related to the sub topic are presented in an easy to use manner and examples on the use of the equations including appropriate figures and tables are also included Provides a complete and up to date treatment of all major subjects of underwater acoustics Presents chapters written by recognized experts in their individual field Covers the fundamental knowledge scientists and engineers need to solve problems in underwater acoustics Illuminates in shorter sub chapters the modern applications of underwater acoustics that are described in worked examples Demands no prior knowledge of underwater acoustics and the physical principles and mathematics are designed to be readily understood by scientists engineers and graduate students of underwater acoustics Includes a comprehensive list of literature references for each

chapter Progress in Underwater Acoustics Harold Merklinger, 2012-12-06 IMAGE TRACKS AT HALIFAX by L B Felsen All living kind much effort spend Some model modes some model rays To cope with their environment Some feel that spectra all portrays Some use their eyes some use their nose Then there are those who with despatch To sense where other things repose Take refuge in the ocean wedge For one group nothing s more profound Than to explore the world with sound If things get messy randomize These audio diagnosticians What s partly smooth determinize You ponder is it this or that Go by the name of acousticians And wish you were a lowly bat They regularly meet to check Whether their sonogram s on track The meeting s hosts did treat us well With images stored in their packs They let the climate cast its spell This year they came to Halifax No weath ry hope was placed in vain There they combined with ocean types We were exposed to wind and rain And each could hear the other s gripes We glimpsed blue sky through clouds dispersed A meeting naturally does start But rainy sequence was reversed Reviewing present state of art The ocean types would like it wet What we found out is where it s at Yet they got stuck with sun instead We cannot hope to match the bat Each confrence has the same refrain Computer printouts by the reams It has been fun to meet again **Underwater Acoustics and Signal Processing** L.

Bjørnø, 2012-12-06 The comprehensive research activity around the World in the fields of Underwater Acoustics and Signal Processing being strongly supported by new experimental technique and equipment and by the parallel fast developments in computer technology and solid state devices which has led to a rapidly reducing cost of digital processing thus enabling more complex processing to be carried out economically emphasize how necessary it is at intervals of a few years through a NATO Advanced Study Institute NATO ASI and guided by leading experts to study the conquests in the fields of Underwater Acoustics and Signal Processing This need of study is moreover stressed by the interdisciplinarity of Underwater Acoustics and Signal Processing where a strong impact from other branches of science Geophysics Radioastronomy Bioengineering Telecommunication Seismology Space Research etc is taking place which makes it an extremely difficult task for scientists to follow up the development in all its phases and to preserve the general view of its rapidly increasing number of possibilities The present Proceedings of the NATO ASI held in Copenhagen during August 1980 join the series of proceedings of NATO summer schools on Underwater Acoustics and Signal Processing held during the past 20 years The equality and the fusion of the individual research fields of Underwater Acoustics and Signal Processing and the separate introduction of advanced research results from other scientific areas related to underwater acoustics such as transducers characterize the subject matter of this NATO ASI **Adaptive Methods in Underwater Acoustics** H.G. Urban, 2012-12-06 The NATO Advanced Study Institute on Adaptive Methods in Underwater Acoustics was held on 30 July 10 August 1984 in LLineburg Germany The Institute was primarily concerned with signal processing for underwater applications The majority of the presentations when taken together yield a definite picture of the present status of understanding of adaptive and high resolution processing setting out the progress achieved over the past four years together with the major problem areas remaining

Major effort was made to obtain a commensurate contribution of tutorial and advanced research papers. It is my hope that the material in this volume may be equally well suited for students getting an introduction to some of the basic problems in underwater signal processing and for the professionals who may obtain an up to date overview of the present state of the art. This might be especially useful in view of the controversy and lack of adequate interrelationships which have marked this rapidly expanding field in the past. Practical reinforcement of this picture is provided by the material concerning digital and optical processing technology giving some guidance to achievable adaptive and high resolution techniques with current processing devices. The formal programme was extended and detailed by a series of six evening work shops on specific topics during which informal discussions took place among the participants. Summaries of these workshops are also included in these Proceedings.

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