

COASTAL SYSTEMS AND CONTINENTAL MARGINS

Natural Gas Hydrate

in Oceanic and Permafrost Environments

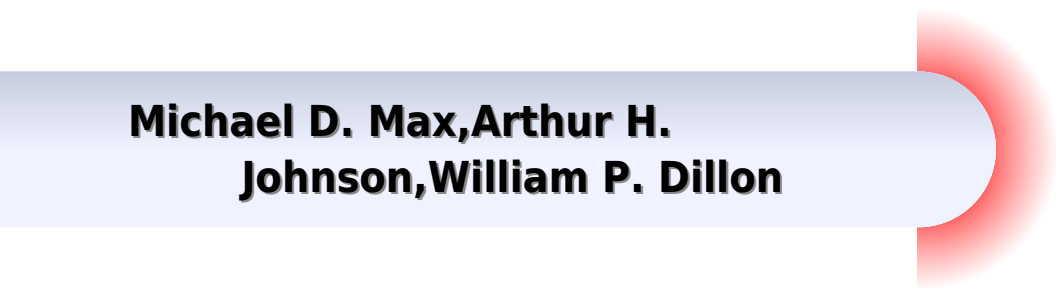
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Natural Gas Hydrate In Oceanic And Permafrost Environments

**Michael D. Max, Arthur H.
Johnson, William P. Dillon**



Natural Gas Hydrate In Oceanic And Permafrost Environments:

Natural Gas Hydrate M.D. Max, 2012-12-06 1 THE BEGINNINGS OF HYDRATE RESEARCH Until very recently our understanding of hydrate in the natural environment and its impact on seafloor stability its importance as a sequester of methane and its potential as an important mechanism in the Earth's climate change system was masked by our lack of appreciation of the vastness of the hydrate resource Only a few publications on naturally occurring hydrate existed prior to 1975 The first published reference to oceanic gas hydrate Bryan and Markl 1966 and the first publication in the scientific literature Stoll et al 1971 show how recently it has been since the topic of naturally occurring hydrate has been raised Recently however the number of hydrate publications has increased substantially reflecting increased research into hydrate topics and the initiation of funding to support the researchers Awareness of the existence of naturally occurring gas hydrate now has spread beyond the few scientific enthusiasts who pursued knowledge about the elusive hydrate because of simple interest and lurking suspicions that hydrate would prove to be an important topic The first national conference on gas hydrate in the U S was held as recently as April 1991 at the U S National Center of the U s Geological Survey in Reston Virginia Max et al 1991 The meeting was co hosted by the U s Geological Survey the Naval Research Laboratory and the U S

Natural Gas Hydrate in Oceanic and Permafrost Environments M D Max, 2000-11-30 Natural Gas Hydrate in Oceanic and Permafrost Environments M.D. Max, 2003-05-31 This is the first book published on the emerging research field of naturally occurring gas hydrates focusing on methane hydrate that is not primarily a physical chemistry textbook This book is designed as a broad introduction to the field of hydrate science demonstrating the significance of the hydrate cycle to energy resource potential seafloor stability and global climate and climate change along with other issues The best known hydrate localities are described as are research and laboratory methods and results The book consists of chapters grouped in related themes that present up to date information on methane hydrate Each of the contributing authors is expert in hydrate science and most have been carrying out research in hydrate for a considerable time Audience This book will be an important source of information for marine geologists geophysicists geochemists and petroleum geologists and regulators It is also intended as a graduate level textbook Exploration and Production of Oceanic Natural Gas Hydrate Michael D. Max, Arthur H. Johnson, 2018-10-24 This second edition provides extensive information on the attributes of the Natural Gas Hydrate NGH system highlighting opportunities for the innovative use and modification of existing technologies as well as new approaches and technologies that have the potential to dramatically lower the cost of NGH exploration and production Above all the book compares the physical environmental and commercial aspects of the NGH system with those of other gas resources It subsequently argues and demonstrates that natural gas can provide the least expensive energy during the transition to and possibly within a renewable energy future and that NGH poses the lowest environmental risk of all gas resources Intended as a non mathematical descriptive text that should be understandable to non specialists as well as to engineers concerned with

the physical characteristics of NGH reservoirs and their production the book is written for readers at the university graduate level It offers a valuable reference guide for environmentalists and the energy community and includes discussions that will be of great interest to energy industry professionals legislators administrators regulators and all those concerned with energy options and their respective advantages and disadvantages

Natural Gas Hydrate - Arctic Ocean Deepwater Resource Potential Michael D. Max, Arthur H. Johnson, William P. Dillon, 2013-10-11 The book is an up to date basic reference for natural gas hydrate NGH in the Arctic Ocean Geographical geological environmental energy new technology and regulatory matters are discussed The book should be of interest to general readers and scientists and students as well as industry and government agencies concerned with energy and ocean management NGH is a solid crystalline material that compresses gas by about a factor of about 164 during crystallization from natural gas mainly methane rich pore waters over time NGH displaces water and may form large concentrations in sediment pore space Its formation introduces changes in the geotechnical character of host sediment that allows it to be distinguished by seismic and electric exploration methods The chemical reaction that forms NGH from gas and water molecules is highly reversible which allows controlled conversion of the NGH to its constituent gas and water This can be achieved rapidly by one of a number of processes including heating depressurization inhibitor injection dissolution and molecular replacement The produced gas has the potential to make NGH a valuable unconventional natural gas resource and perhaps the largest on earth Estimates for NGH distribution concentration economic targets and volumes in the Arctic Ocean have been carried out by restricting the economic target to deepwater turbidite sands which are also sediment hosts for more deeply buried conventional hydrocarbon deposits Resource base estimates are based on NGH petroleum system analysis approach using industry standard parameters along with analogs from three relatively well known examples Nankai Japan Gulf of Mexico United States and Arctic permafrost hydrate Drilling data has substantiated new geotechnical level seismic analysis techniques for estimating not just the presence of NGH but prospect volumes In addition to a volumetric estimate for NGH having economic potential a sedimentary depositional model is proposed to aid exploration in the five different regions around the deep central Arctic Ocean basin Related topics are also discussed Transport and logistics for NGH may also be applicable for stranded conventional gas and oil deposits Arising from a discussion of new technology and methodologies that could be applied to developing NGH suggestions are made for the lowering of exploration and capital expenses that could make NGH competitive on a produced cost basis The basis for the extraordinarily low environmental risk for exploration and production of NGH is discussed especially with respect to the environmentally fragile Arctic region It is suggested that because of the low environmental risk special regulations could be written that would provide a framework for very low cost and safe development

Natural Gas Hydrates Timothy S. Collett, Art Johnson, Camelia C. Knapp, Ray Boswell, 2010-01-14 Hardcover plus CD

Economic Geology of Natural Gas Hydrate Michael D. Max, Arthur H. Johnson, William P. Dillon, 2006-07-09 This

book is a companion to Natural Gas Hydrate in Oceanic and Permafrost Environments Max 2000 2003 which is the first book on gas hydrate in this series Although other gases can naturally form clathrate hydrates referred to after as hydrate we are concerned here only with hydrocarbon gases that form hydrates The most important of these natural gases is methane Whereas the first book is a general introduction to the subject of natural gas hydrate this book focuses on the geology and geochemical controls of gas hydrate development and on gas extraction from naturally occurring hydrocarbon hydrates This is the first broad treatment of gas hydrate as a natural resource within an economic geological framework This book is written mainly to stand alone for brevity and to minimize duplication Information in Max 2000 2003 should also be consulted for completeness Hydrate is a type of clathrate Sloan 1998 that is formed from a cage structure of water molecules in which gas molecules occupying void sites within the cages stabilize the structure through van der Waals or hydrogen bonding

Economic Geology of Natural Gas Hydrate Michael D. Max, Arthur H. Johnson, William P. Dillon, 2005-12-21 This book is a companion to Natural Gas Hydrate in Oceanic and Permafrost Environments Max 2000 2003 which is the first book on gas hydrate in this series Although other gases can naturally form clathrate hydrates referred to after as hydrate we are concerned here only with hydrocarbon gases that form hydrates The most important of these natural gases is methane Whereas the first book is a general introduction to the subject of natural gas hydrate this book focuses on the geology and geochemical controls of gas hydrate development and on gas extraction from naturally occurring hydrocarbon hydrates This is the first broad treatment of gas hydrate as a natural resource within an economic geological framework This book is written mainly to stand alone for brevity and to minimize duplication Information in Max 2000 2003 should also be consulted for completeness Hydrate is a type of clathrate Sloan 1998 that is formed from a cage structure of water molecules in which gas molecules occupying void sites within the cages stabilize the structure through van der Waals or hydrogen bonding

Exploration of Gas Hydrates Naresh Kumar Thakur, Sanjeev Rajput, 2010-10-08 Gas hydrates are ice like crystalline substances that form a rigid cage of water molecules and entrap hydrocarbon and non hydrocarbon gas by hydrogen bonding Natural gas hydrate is primarily composed of water and methane These are solid crystalline ice like substances found in permafrost areas and deepwater basins around the world They naturally occur in the pore space of marine sediments where appropriate high pressure and low temperature conditions exist in an adequate supply of gas mainly methane Gas hydrates are considered as a potential non conventional energy resource Methane hydrates are also recognized as an influence on offshore platform stability a major factor in climate change contributing to global warming and a significant contribution to the ocean carbon cycle The proposed book treats various geophysical techniques in order to quantify the gas hydrate reserves and their impact on environment The primary goal of this book is to provide the state of art for gas hydrate exploration The target audiences for this book are non specialist from different branches of science graduate students and researchers

Oceanic Methane Hydrates Lin Chen, Sukru Merey, 2021-01-10 Methane hydrates are still a complicated

target for today's oil and gas offshore engineers particularly the lack of reliable real field test data or obtaining the most recent technology available on the feasibility and challenges surrounding the extraction of methane hydrates Oceanic Methane Hydrates delivers the solid foundation as well as today's advances and challenges that remain Starting with the fundamental knowledge on gas hydrates the authors define the origin estimations and known exploration and production methods Historical and current oil and gas fields and roadmaps containing methane hydrates around the world are also covered to help lay the foundation for the early career engineer Lab experiments and advancements in numerical reservoir simulations transition the engineer from research to practice with real field core sampling techniques covered points on how to choose producible methane hydrate reservoirs and the importance of emerging technologies Actual comparable onshore tests from around the world are included to help the engineer gain clarity on field expectations Rounding out the reference are emerging technologies in all facets of the business including well completion and monitoring economics aspects to consider and environmental challenges particularly methods to reduce the costs of methane hydrate exploration and production techniques Rounding out a look at future trends Oceanic Methane Hydrates covers both the basics and advances needed for today's engineers to gain the required knowledge needed to tackle this challenging and exciting future energy source Understand real data and practice examples covering the newest developments of methane hydrate from chemical reservoir modelling and production testing Gain worldwide coverage and analysis of the most recent extraction production tests Cover the full range of emerging technologies and environmental sustainability including current regulations and policy outlook

The Status of Natural Resources on the High-seas Southampton Oceanography Centre,A. Charlotte De Fontaubert,International Union for Conservation of Nature and Natural Resources,2001

Investigating Seafloors and Oceans Antony Joseph,2016-12-08 Investigating Seafloors and Oceans From Mud Volcanoes to Giant Squid offers a bottom to top tour of the world's oceans exposing the secrets hidden therein from a variety of scientific perspectives Opening with a discussion of the earth's formation hot spots ridges plate tectonics submarine trenches and cold seeps the text goes on to address such topics as the role of oceans in the origin of life tidal bore thermal effects ecosystem services marine creatures and nutraceutical and pharmaceutical resources This unique reference provides insight into a wide array of questions that researchers continue to ask about the vast study of oceans and the seafloor It is a one of a kind examination of oceans that offers important perspectives for researchers practitioners and academics in all marine related fields Includes chapters addressing various scientific disciplines offering the opportunity for readers to gain insights on diverse topics in the study of oceans Provides scientific discussion on thermo tolerant microbial life in sub seafloor hot sediments and vent fields as well as the origin of life debates and the puzzles revolving around how life originated Includes detailed information on the origin of dreaded episodes such as volcanic eruptions earthquakes tsunamis internal waves and tidal bores Contains information on the contribution of the oceans in terms of providing useful nutraceutical and pharmaceutical products

Encyclopedia of

the Arctic Mark Nuttall,2005-09-23 With detailed essays on the Arctic's environment wildlife climate history exploration resources economics politics indigenous cultures and languages conservation initiatives and more this Encyclopedia is the only major work and comprehensive reference on this vast complex changing and increasingly important part of the globe Including 305 maps This Encyclopedia is not only an interdisciplinary work of reference for all those involved in teaching or researching Arctic issues but a fascinating and comprehensive resource for residents of the Arctic and all those concerned with global environmental issues sustainability science and human interactions with the environment

Gas Hydrates Carlo Giavarini,Keith Hester,2011-09-06 Gas hydrates are both a huge energy resource and an environmental challenge They have a significant impact on society because of their applications to the future of energy protection of the environment and fuel transportation Gas Hydrates opens up this fascinating multidisciplinary field to non specialists It provides a scientific study of gas hydrates that considers their potential as an energy source while assessing the possible risk to the environment The authors also examine the feasibility of using these natural compounds for storing and transporting gases such as methane and carbon dioxide Diagrams and photos are used throughout Gas Hydrates to help readers understand the scientific and technical content Each section has been designed so it can be read independently by academics and professionals in the oil and gas industry as well as by all those with an interest in how hydrates combine to be an energy resource an industrial challenge and a geological hazard

Methane Gas Hydrate Ayhan Demirbas,2010-02-28 Gas hydrates represent one of the world's largest untapped reservoirs of energy and according to some estimates have the potential to meet global energy needs for the next thousand years Methane Gas Hydrate examines this potential by focusing on methane gas hydrate which is increasingly considered a significant source of energy Methane Gas Hydrate gives a general overview of natural gas before delving into the subject of gas hydrates in more detail and methane gas hydrate in particular As well as discussing methods of gas production it also discusses the safety and environmental concerns associated with the presence of natural gas hydrates ranging from their possible impact on the safety of conventional drilling operations to their influence on Earth's climate Methane Gas Hydrate is a useful reference on an increasingly popular energy source It contains valuable information for chemical engineers and researchers as well as for postgraduate students

Marine Policy and Economics Porter Hoagland,John H. Steele,Steve A. Thorpe,2010 This title is an important reference on current knowledge and expertise in one convenient and accessible source The selected articles all written by experts in their field fall into several categories

Encyclopedia of Ocean Engineering Weicheng Cui,Shixiao Fu,Zhiqiang Hu,2022-06-29 This encyclopedia adopts a wider definition for the concept of ocean engineering Specifically it includes 1 offshore engineering fixed and floating offshore oil and gas platforms pipelines and risers cables and moorings buoy technology foundation engineering ocean mining marine and offshore renewable energy aquaculture engineering and subsea engineering 2 naval architecture ship and special marine vehicle design intact and damaged stability technology for energy efficiency and green shipping ship

production technology decommissioning and recycling 3 polar and Arctic Engineering ice mechanics ice structure interaction polar operations polar design environmental protection 4 underwater technologies AUV ROV design AUV ROV hydrodynamics maneuvering and control and underwater specific communicating and sensing systems for AUV ROVs It summarizes the A Z of the background and application knowledge of ocean engineering for use by ocean scientists and ocean engineers as well as nonspecialists such as engineers and scientists from all disciplines economists students and politicians Ocean engineering theories ocean devices and equipment ocean design and operation technologies are described by international experts many from industry and each entry offers an introduction and references for further study making current technology and operating practices available for future generations to learn from The book also furthers our understanding of the current state of the art leading to new and more efficient technologies with breakthroughs from new theory and materials As the land resources approach the exploitation limit ocean resources are becoming the next choice for the sustainable development As such ocean engineering is vital in the 21st century *Natural Gas Hydrates* Scott L. Montgomery, 2003

Conference on the Geophysical Detection of Subsurface Water on Mars Conference on the Geophysical Detection of Subsurface Water on Mars, 2001 The primary goal of the conference is to identify the most direct unambiguous and cost effective approach to assessing the three dimensional distribution and state of water within the martian crust at a resolution sufficient to permit reaching any desired volatile target by drilling

Gulf of Mexico Origin, Waters, and Biota Noreen A. Buster, Charles W. Holmes, 2011-05-30 Volume 3 of Gulf of Mexico Origin Waters and Biota a series edited by John W Tunnell Jr Darryl L Felder and Sylvia A Earle A continuation of the landmark scientific reference series from the Harte Research Institute for Gulf of Mexico Studies Gulf of Mexico Origin Waters and Biota Volume 3 Geology provides the most up to date systematic cohesive and comprehensive description of the geology of the Gulf of Mexico Basin The six sections of the book address the geologic history recent depositional environments and processes offshore and along the coast of the Gulf of Mexico Scientific research in the Gulf of Mexico region is continuous extensive and has broad based influence upon scientific governmental and educational communities This volume is a compilation of scientific knowledge from highly accomplished and experienced geologists who have focused most of their careers on gaining a better understanding of the geology of the Gulf of Mexico Their research presented in this volume describes and explains the formation of the Gulf Basin Holocene stratigraphic and sea level history energy resources coral reefs and depositional processes that affect and are represented along our Gulf coasts It provides valuable synthesis and interpretation of what is known about the geology of the Gulf of Mexico Five years in the making this monumental compilation is both a lasting record of the current state of knowledge and the starting point for a new millennium of study

Reviewing **Natural Gas Hydrate In Oceanic And Permafrost Environments**: Unlocking the Spellbinding Force of Linguistics

In a fast-paced world fueled by information and interconnectivity, the spellbinding force of linguistics has acquired newfound prominence. Its capacity to evoke emotions, stimulate contemplation, and stimulate metamorphosis is actually astonishing. Within the pages of "**Natural Gas Hydrate In Oceanic And Permafrost Environments**," an enthralling opus penned by a very acclaimed wordsmith, readers embark on an immersive expedition to unravel the intricate significance of language and its indelible imprint on our lives. Throughout this assessment, we shall delve in to the book is central motifs, appraise its distinctive narrative style, and gauge its overarching influence on the minds of its readers.

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Natural Gas Hydrate In Oceanic And Permafrost Environments Introduction

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