

Antarctic Sea Ice

Physical Processes, Interactions and Variability



Martin C. Jeffries
Editor



Antarctic Sea Ice Biological Processes Interactions And Variability Antarctic Research Series

Matti Leppäranta



Antarctic Sea Ice Biological Processes Interactions And Variability Antarctic Research Series:

Antarctic Sea Ice Michael P. Lizotte, Kevin R. Arrigo, 1998-02-04 Published by the American Geophysical Union as part of the Antarctic Research Series Volume 73 The 4 million to 20 million square kilometers of sea ice that surrounds the Antarctic continent represents one of the largest and most dynamic ecosystems on Earth This sea ice matrix provides a habitat for a wide variety of organisms some of which live their entire lives within the ice while others are only occasional visitors Large grazers such as copepods and krill which come to the sea ice to feed represent important links between sea ice biota and the pelagic environment Unfortunately because of the inherent difficulty of sampling such an environment many aspects of this unique habitat are still poorly understood The purpose of this volume is to present new information about this ecosystem so that its role within the Antarctic food web and as a sink for carbon dioxide and its susceptibility to environmental changes can be better understood Oceanography and Marine Biology, An Annual Review, Volume 40 R. N. Gibson, Margaret

Barnes, R. J. A. Atkinson, 2002-08-29 Interest in oceanography and marine biology and its relevance to global environmental issues continues to increase creating a demand for authoritative reviews that summarize recent research Oceanography and Marine Biology An Annual Review has catered to this demand since its foundation by the late Harold Barnes more than 40 years ago It is an *Encyclopedia of Snow, Ice and Glaciers* Vijay P. Singh, Pratap Singh, Umesh K. Haritashya, 2011-06-29 The earth's cryosphere which includes snow glaciers ice caps ice sheets ice shelves sea ice river and lake ice and permafrost contains about 75% of the earth's fresh water It exists at almost all latitudes from the tropics to the poles and plays a vital role in controlling the global climate system It also provides direct visible evidence of the effect of climate change and therefore requires proper understanding of its complex dynamics This encyclopedia mainly focuses on the various aspects of snow ice and glaciers but also covers other cryospheric branches and provides up to date information and basic concepts on relevant topics It includes alphabetically arranged and professionally written comprehensive and authoritative academic articles by well known international experts in individual fields The encyclopedia contains a broad spectrum of topics ranging from the atmospheric processes responsible for snow formation transformation of snow to ice and changes in their properties classification of ice and glaciers and their worldwide distribution glaciation and ice ages glacier dynamics glacier surface and subsurface characteristics geomorphic processes and landscape formation hydrology and sedimentary systems permafrost degradation hazards caused by cryospheric changes and trends of glacier retreat on the global scale along with the impact of climate change This book can serve as a source of reference at the undergraduate and graduate level and help to better understand snow ice and glaciers It will also be an indispensable tool containing specialized literature for geologists geographers climatologists hydrologists and water resources engineers as well as for those who are engaged in the practice of agricultural and civil engineering earth sciences environmental sciences and engineering ecosystem management and other relevant subjects **Sea Ice** David N. Thomas, Gerhard S. Dieckmann, 2008-04-15 Sea ice which covers up to 7% of the

planet's surface is a major component of the world's oceans partly driving ocean circulation and global climate patterns. It provides a habitat for a rich diversity of marine organisms and is an extremely valuable source of information in studies of global climate change and the evolution of present-day life forms. Increasingly, sea ice is being used as a proxy for extraterrestrial ice-covered systems. Sea Ice provides a comprehensive review of our current available knowledge of polar pack ice, the study of which is severely constrained by the logistic difficulties of working in such harsh and remote regions of the earth. The book's editors, Drs Thomas and Dieckmann, have drawn together an impressive group of international contributing authors providing a well-edited and integrated volume which will stand for many years as the standard work on the subject. Contents of the book include details of the growth, microstructure and properties of sea ice; large-scale variations in thickness and characteristics; its primary production; micro and macrobiology; sea ice as a habitat for birds and mammals; sea ice biogeochemistry; particulate flux; and the distribution and significance of palaeo sea ice. Sea Ice is an essential purchase for oceanographers and marine scientists, environmental scientists, biologists, geochemists and geologists. All those involved in the study of global climate change will find this book to contain a wealth of important information. All libraries in universities and research establishments where these subjects are studied and taught will need multiple copies on their shelves. David Thomas is at the School of Ocean Sciences, University of Wales Bangor, UK. Gerhard Dieckmann is at the Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany.

Encyclopedia of the Antarctic Beau Riffenburgh, 2007. Publisher description: Polar Remote Sensing Dan Lubin, Robert Massom, 2006-08-31. The polar regions, perhaps more than any other places on Earth, give the geophysical scientist a sense of exploration. This sensibility is genuine for not only is high-latitude fieldwork arduous, with many locations seldom or never visited, but there remains much fundamental knowledge yet to be discovered about how the polar regions interact with the global climate system. The range of opportunities for new discovery becomes strikingly clear when we realize that the high latitudes are not one region but are really two vastly different worlds. The high Arctic is a frozen ocean surrounded by land and is home to fragile ecosystems and unique modes of human habitation. The Antarctic is a frozen continent without regular human habitation, covered by ice sheets taller than many mountain ranges and surrounded by the Earth's most forbidding ocean. When we consider global change as applied to the Arctic, we discuss impacts to a region whose surface and lower atmospheric temperatures are near the triple point of water throughout much of the year. The most consistent signatures of climate warming have occurred at northern high latitudes. IPCC 2001 and the potential impacts of a few degrees increase in surface temperature include a reduction in sea ice extent, a positive feedback to climate warming due to lowering of surface albedo, and changes to surface runoff that might affect the Arctic Ocean's salinity and circulation.

The West Antarctic Ice Sheet, 1998. **The Ecology of Snow and Ice Environments** Johanna Laybourn-Parry, Martyn Tranter, Andrew J. Hodson, 2012-02-02. The majority of extremophiles in ice and snow are microorganisms. **Advances in Marine Biology** Alan J. Southward, Craig M. Young, Lee

A. Fuiman, 2002-07-12 Volume 43 is an eclectic volume with reviews on ecology and biogeography of marine parasites fecundity characteristics and role in life history strategies of marine invertebrates the ecology of Southern Ocean Pack ice and biological and remote sensing perspectives of pigmentation in coral reef organisms Advances in Marine Biology was first published in 1963 Now edited by A J Southward Marine Biological Association UK P A Tyler Southampton Oceanography Association UK C M Young Harbor Branch Oceanographic Institution USA and L A Fuiman University of Texas USA the serial publishes in depth and up to date reviews on a wide range of topics which will appeal to postgraduates and researchers in marine biology fisheries science ecology zoology oceanography Eclectic volumes in the series are supplemented by thematic volumes on such topics as The Biology of Calanoid Copepods AMB first published 1963 This volume presents a selection of reviews on the biology of lesser known taxa of the phylum Mollusca including The mostly diminutive protobranch bivalves The slug like shelled opisthobranchs The highly specialized and evolutionarily advanced tusk shells The beautiful priceless yet frustratingly hard to collect slit shells

The Sea, Volume 14B: the Global Coastal Ocean Allan R. Robinson, Kenneth H. Brink, 2006 In multidisciplinary efforts to understand and manage our planet contemporary ocean science plays an essential role Volumes 13 and 14 of The Sea focus on two of the most important components in the field of ocean science today the coastal ocean and its interactions with the deep sea and coupled physical biogeochemical and ecosystem dynamics

Biology of the Southern Ocean George A. Knox, 2006-12-13 First published in 1993 The Biology of the Southern Ocean has been referred to as international research at its best and an invaluable reference Drawing on the considerable volume of information published in the last ten years this second edition retains the format that made the first edition a popular bestseller while updating the information with the latest research results available The book begins with a description of the physico chemical environment and in a logical sequence covers phytoplankton and primary production the sea ice microbial communities and the secondary consumers the zooplankton The author includes an extended chapter on the biology and ecology of Antarctic krill that highlights its central position in the Southern Ocean food web A series of chapters consider the higher consumers nekton with an emphasis on cephalopods fish seals whales and seabirds The following chapters explore selected ecosystem components the benthic communities life beneath the fast ice and ice shelves recent advances in understanding decomposition processes and the role of bacteria and protozoa The author synthesizes ecosystem dynamics with an emphasis on the pelagic ecosystem He covers resource exploitation the impact of such exploitation on the marine ecosystem and the problems involved in the management of the living resources His epilogue summarizes the extent to which our understanding of the functioning of the Antarctic marine ecosystem has changed in the last 50 years for example there has been a dramatic change in our view of krill and its role in the Southern Ocean marine ecosystem The book concludes with the statement that research carried out under the AGCS Programme and the Scientific Committee on Antarctic Research SCAR will continue to provide critical information on the functioning of Antarctic marine ecosystems Intended for

all those with an ongoing interest in Antarctic research conservation and management this volume represents one of the most authoritative resources in the field as it covers all aspects of this important marine ecosystem *Polynyas: Windows to the World* Walker O. Smith Jr., David Barber, 2007-07-09 Approx 474 pages Approx 474 pages **Sea Ice** Mohammed Shokr, Nirmal K. Sinha, 2023-04-20 SEA ICE The latest edition of the gold standard in sea ice references In the newly revised second edition of *Sea Ice Physics and Remote Sensing* a team of distinguished researchers delivers an in depth review of the features and structural properties of ice as well as the latest advances in geophysical sensors ice parameter retrieval techniques and remote sensing data The book has been updated to reflect the latest scientific developments in macro and micro scale sea ice research For this edition the authors have included high quality photographs of thin sections from cores of various ice types as well as a comprehensive account of all major field expeditions that have systematically surveyed sea ice and its properties Readers will also find A thorough introduction to ice physics and physical processes including ice morphology and age based structural features Practical discussions of radiometric and radar scattering observations from sea ice including radar backscatter and microwave emission The latest techniques for the retrieval of sea ice parameters from space borne and airborne sensor data New chapters on sea ice thermal microwave emissions and on the impact of climate change on polar sea ice Perfect for academic researchers working on sea ice the cryosphere and climatology *Sea Ice Physics and Remote Sensing* will also benefit meteorologists marine operators and high latitude construction engineers

Arctic Sea Ice Ecology Lars Chresten Lund-Hansen, Dorte Haubjerg Søgaard, Brian Keith Sorrell, Rolf Gradinger, Klaus Martin Meiners, 2020-08-07 The book on sea ice ecology is the ecology of sea ice algae and other microorganism as bacteria meiofauna and viruses residing inside or at the bottom of the sea ice called the sympagic biota Organisms as seals fish birds and Polar bears relies on sea ice but are not part of this biota A distinct feature of this ecosystem is the disappearance melt every summer and re establishing in autumn and winter The book is organized seasonally describing the physical optical biological and geochemical conditions typical of the seasons autumn winter and spring These are exemplified with case studies based on author s fieldwork in Greenland the Arctic Ocean and Antarctica but focused on Arctic conditions The sea ice ecosystem is described in the context of climate change interests and effects of a decreasing summer ice extent in the Arctic Ocean The book contains an up to date description of most relevant methods and techniques applied in sea ice ecology research This book will appeal to university students at Masters or PhD levels reading biology geosciences and chemistry

Marine Ecosystem Assessment for the Southern Ocean: Meeting the Challenge for Conserving Earth Ecosystems in the Long Term Monica M. C. Muelbert, 2024-12-24 National and international agencies need assessments of change in ecosystems and their drivers in order to sustain natural systems to maintain the delivery of services and to meet the challenge for conserving Earth ecosystems in the long term In marine systems change may arise directly from human activities e g fisheries indirectly from local or global activities cascading effects through food webs from fisheries or changing

environments from climate change and or ocean acidification or from naturally varying processes A particular challenge for managers is to identify how dangerous future climate change will be for ecosystems and their services and whether mitigation or adaptation may be needed in advance in order to achieve the conservation requirements For regions of international attention particularly those that have the attention of many management or policy oriented bodies a standardized process is needed to harmonize the scientific information on the status and trends in ecosystems used by the different bodies That process also needs to ensure the information is available in a timely manner For example assessments of change in habitats species and or food webs in the Southern Ocean are currently compiled separately for at least ten different international organizations or processes A Marine Ecosystem Assessment for the Southern Ocean MEASO aims to harmonize that information for policy makers This assessment began with an international conference in April 2018 <http://www.measo2018.aq> where it was agreed to undertake the first MEASO over 2018-2019 with the view to provide the outcomes to relevant bodies such as the Scientific Committee for the Conservation of Antarctic Marine Living Resources soon after

The Drift of Sea Ice Matti Leppäranta, 2007-03-06 The author presents in *The Drift of Sea Ice* the fundamental laws of sea ice drift which come from the material properties of sea ice and the basic laws of mechanics The resulting system of equations is analysed for the general properties of sea ice drift the free drift model and analytical models for ice drift in the presence of internal friction and the construction of numerical ice drift models is detailed The science of sea ice drift through its 100 year history to the present day is explained The text includes the geophysical theory observations from field programs and mathematical models Topics covered include the science of sea ice drift forecasting drift velocity based on volume size and shape sea ice ridging and remote sensing modelling of the ice conditions and finally the role of sea ice drift in research fields in ice covered seas oceanography marine ecology and engineering

On Sea Ice Willy Weeks, 2010-06-15 Covering more than seven percent of the earth's surface sea ice is crucial to the functioning of the biosphere and is a key component in our attempts to understand and combat climate change With *On Sea Ice* geophysicist W F Weeks delivers a natural history of sea ice a fully comprehensive and up to date account of our knowledge of its creation change and function The volume begins with the earliest recorded observations of sea ice from 350 BC but the majority of its information is drawn from the period after 1950 when detailed study of sea ice became widespread Weeks delves into both micro level characteristics internal structure component properties and phase relations and the macro level nature of sea ice such as salinity growth and decay He also explains the mechanics of ice pack drift and the recently observed changes in ice extent and thickness An unparalleled account of a natural phenomenon that will be of increasing importance as the earth's temperature rises *On Sea Ice* will unquestionably be the standard for years to come

Adaptation and Evolution in Marine Environments, Volume 1 Guido di Prisco, Cinzia Verde, 2012-02-29 The poles undergo climate changes exceeding those in the rest of the world in terms of their speed and extent and have a key role in modulating the climate of the Earth

Ecosystems adapted to polar environments are likely to become vulnerable to climate changes. Their responses allow us to analyse and foresee the impact of changes at lower latitudes. We need to increase our knowledge of the polar marine fauna of continental shelves, slopes and deep sea as identifying the responses of species and communities is crucial to establishing efficient strategies against threats to biodiversity using international and cross disciplinary approaches. The IPY 2007-2009 was a scientific milestone. The outstanding contribution of Marine Biology is reflected in this volume and the next one on Adaptation and Evolution in Marine Environments. The Impacts of Global Change on Biodiversity from the series From Pole to Pole making these volumes a unique and invaluable component of the scientific outcome of the IPY.

World Ocean Assessment Alan Simcock, 2017-04-17. This United Nations report examines the current state of knowledge of the world's oceans for policymakers and provides a reference for marine science courses.

Antarctic Ecosystems Alex D. Rogers, Nadine M. Johnston, Eugene J. Murphy, Andrew Clarke, 2012-02-28. Since its discovery Antarctica has held a deep fascination for biologists. Extreme environmental conditions, seasonality and isolation have led to some of the most striking examples of natural selection and adaptation on Earth. Paradoxically some of these adaptations may pose constraints on the ability of the Antarctic biota to respond to climate change. Parts of Antarctica are showing some of the largest changes in temperature and other environmental conditions in the world. In this volume published in association with the Royal Society leading polar scientists present a synthesis of the latest research on the biological systems in Antarctica covering organisms from microbes to vertebrate higher predators. This book comes at a time when new technologies and approaches allow the implications of climate change and other direct human impacts on Antarctica to be viewed at a range of scales across entire regions, whole ecosystems and down to the level of species and variation within their genomes. Chapters address both Antarctic terrestrial and marine ecosystems and the scientific and management challenges of the future are explored.

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