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# Seasonal Carbon Cycling in the Sargasso Sea near Bermuda

Nicolas Gruber and Charles D. Keeling

University of California Press

# Seasonal Carbon Cycling In The Sargasso Sea Near Bermuda

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## **Seasonal Carbon Cycling In The Sargasso Sea Near Bermuda:**

**Seasonal Carbon Cycling in the Sargasso Sea Near Bermuda** Nicolas Gruber, Charles D. Keeling, 1999-10-04 Each year the concentration of dissolved inorganic carbon DIC in the mixed layer at Station S in the Sargasso Sea decreases from winter to summer by about 30  $\mu\text{mol kg}^{-1}$ . The authors of this study demonstrate that by simultaneously observing changes in the stable isotopic ratio of DIC it is possible to quantify the contribution of physical and biological processes to this summer fall drawdown. They find that biology is the dominant contributor to the drawdown but that physical processes also play an important role.

**Oceans** James Fargo Balliett, 2014-12-18 Covering 71 percent of the planet these saline bodies of water provided the unique conditions necessary for the building blocks of life to form billions of years ago. This book explains how our oceans continue to support and influence life in important ways by providing the largest global source of protein in the form of fish populations by creating and influencing weather systems and by absorbing waste streams such as airborne carbon. It is shown how oceans have an almost magnetic draw: almost half of the world's population lives within a few hours of an ocean. Although oceans are vast in size, exceeding 328 million cubic miles (1.37 billion cubic kilometers), they have been influenced by and have influenced humans in numerous ways. The book includes three detailed case studies. The first focuses on the most remote locations along the Mid Atlantic Ridge where new ocean floor is being formed twenty thousand feet underwater. The second considers the Maldives, a string of islands in the Indian Ocean where increasing sea levels may force residents to abandon some communities by 2020. The third describes the North Sea at the edge of the Arctic Ocean where fishing stocks have been dangerously depleted as a result of multiple nations' unrelenting removal of the smallest and largest species.

**Suite on Spiritus Silvestre** Denzil Ford, 2012 Charles D. Keeling climate science oceanography music

**Ocean Dynamics and the Carbon Cycle** Richard G. Williams, Michael J. Follows, 2011-07-14 This textbook for advanced undergraduate and graduate students presents a multidisciplinary approach to understanding ocean circulation and how it drives and controls marine biogeochemistry and biological productivity at a global scale. Background chapters on ocean physics, chemistry, and biology provide students with the tools to examine the range of large-scale physical and dynamic phenomena that control the ocean carbon cycle and its interaction with the atmosphere. Throughout the text, observational data is integrated with basic physical theory to address cutting-edge research questions in ocean biogeochemistry. Simple theoretical models, data plots, and schematic illustrations summarise key results and connect the physical theory to real observations. Advanced mathematics is provided in boxes and appendices where it can be drawn on to assist with the worked examples and homework exercises available online. Further reading lists for each chapter and a comprehensive glossary provide students and instructors with a complete learning package.

**Nitrogen in the Marine Environment** Edward J. Carpenter, Douglas G. Capone, 2013-10-22 Nitrogen in the Marine Environment provides information pertinent to the many aspects of the nitrogen cycle. This book presents the advances in ocean productivity research with emphasis on the role of

microbes in nitrogen transformations with excursions to higher trophic levels Organized into 24 chapters this book begins with an overview of the abundance and distribution of the various forms of nitrogen in a number of estuaries This text then provides a comparison of the nitrogen cycling of various ecosystems within the marine environment Other chapters consider chemical distributions and methodology as an aid to those entering the field This book discusses as well the enzymology of the initial steps of inorganic nitrogen assimilation The final chapter deals with the philosophy and application of modeling as an investigative method in basic research on nitrogen dynamics in coastal and open ocean marine environments This book is a valuable resource for plant biochemists microbiologists aquatic ecologists and bacteriologists Carbon dynamics in freshwater, coastal and oceanic ecosystems in response to the SDG goals Jeng-Wei Tsai, Keisuke Nakayama, 2023-06-23

**Chemical Reference Materials** National Research Council, Division on Earth and Life Studies, Ocean Studies Board, Committee on Reference Materials for Ocean Science, 2002-11-02 The accuracy of chemical oceanographic measurements depends on calibration against reference materials to ensure comparability over time and among laboratories Several key parameters lack reference materials for measurements in seawater particles in the water column and sediments Without reference materials it is difficult to produce the reliable data sets or long term baseline studies that are essential to verify global change and oceanic stability Chemical Reference Materials Setting the Standards for Ocean Science identifies the most urgently required chemical reference materials based on key themes for oceanographic research and provides suggestions as to how they can be developed within realistic cost constraints Chemical analyses of seawater are uniquely difficult given the poorly known speciation and the low concentration of many of the analytes of interest Analyses of suspended and sedimentary marine particulate materials present their own distinct challenges primarily due to potential interference by predominant mineral phases of different types Of all the analytical methods applied to marine waters and particles at present only a small fraction can be systematically evaluated via comparison to reference materials that represent the appropriate natural concentrations and matrices Specifically the committee was charged with the following tasks compile from available sources a list of important oceanographic research questions that may benefit from chemical reference standards create a comprehensive list of reference materials currently available for oceanographic studies identify and prioritize the reference materials needed to study the identified research questions determine for each priority analyte whether reference materials and or analytic methods should be standardized and identify the most appropriate approaches for the development and future production of reference materials for ocean sciences Ocean Biogeochemistry Michael J.R. Fasham, 2012-12-06 Oceans account for 50% of the anthropogenic CO<sub>2</sub> released into the atmosphere During the past 15 years an international programme the Joint Global Ocean Flux Study JGOFS has been studying the ocean carbon cycle to quantify and model the biological and physical processes whereby CO<sub>2</sub> is pumped from the ocean's surface to the depths of the ocean where it can remain for hundreds of years This project is one of the largest multi disciplinary studies of the oceans

ever carried out and this book synthesises the results. It covers all aspects of the topic ranging from air sea exchange with CO<sub>2</sub> the role of physical mixing the uptake of CO<sub>2</sub> by marine algae the fluxes of carbon and nitrogen through the marine food chain to the subsequent export of carbon to the depths of the ocean. Special emphasis is laid on predicting future climatic change.

**1994 Ocean Sciences Meeting**, 1994      **SIO Research Activities**, 1993      **The Changing Ocean Carbon Cycle** Roger B. Hanson, Hugh W. Ducklow, John G. Field, 2000-01-13

The world's oceans act as a reservoir with the capacity to absorb and retain carbon dioxide. The air sea exchange of carbon is driven by physico-chemical forces, photosynthesis and respiration and has an important influence on atmospheric composition. Variability in the ocean carbon cycle could therefore exert significant feedback effects during conditions of climate change. The Joint Global Ocean Flux Study (JGOFS) is the first multidisciplinary program to directly address the interactions among the biology, chemistry and physics of marine systems with emphasis on the transport and transformations of carbon within the ocean and across its boundaries. This unique volume written by an international panel of scientists provides a synthesis of JGOFS science and its achievements to date. The authoritative chapters will be of great interest to readers seeking a current overview of the role of ocean processes in Earth system science and their wider implications for climate change.

**Patterns and Drivers of Nearshore Coastal Air-sea CO<sub>2</sub> Exchange** Kirstin Lee Skadberg, 2008

CO<sub>2</sub> uptake in a nearshore coastal ocean was directly measured using eddy covariance over 27 months in the mid latitude eastern Pacific. The average annual CO<sub>2</sub> uptake during the study was 11.8 mol C m<sup>-2</sup> yr<sup>-1</sup> roughly 25 times greater than the global ocean average. Distinct temporal patterns of CO<sub>2</sub> uptake were resolved at diurnal and seasonal scales. Regression analysis of variance indicates that the major drivers of the observed patterns of uptake are related to photosynthesis with both photosynthetically active radiation and sea surface temperature explaining more of the variability than wind. Warmer sea surface temperatures were correlated with stronger CO<sub>2</sub> uptake the opposite of what would be expected if the solubility pump were in action. Air sea CO<sub>2</sub> flux values calculated using the pCO<sub>2</sub> data and a constant k value of 10 cm hr<sup>-1</sup> were only 25% of the magnitude of direct eddy covariance measurements. The average k value calculated using eddy covariance CO<sub>2</sub> flux and delta pCO<sub>2</sub> values was 48.8 cm hr<sup>-1</sup>. Use of the eddy covariance method to directly measure CO<sub>2</sub> exchange at the air sea interface in coastal waters avoids key uncertainties encountered when exchange is calculated using pCO<sub>2</sub> differences and k-wind speed relationships and it is suggested that the discrepancies that have been observed between eddy covariance CO<sub>2</sub> flux measurements and pCO<sub>2</sub> models could be the result of inadequate inclusion of complexities in pCO<sub>2</sub> models and that direct measurement via eddy covariance is the preferred method in coastal regions. It is concluded that global kelp and sea grass communities could be taking up as much as 2.1 x 10<sup>14</sup> g C 0.21 Pg C of atmospheric CO<sub>2</sub> each year. Therefore macrophyte ecosystems which comprise between 0.6-2.2% of the surface area of the ocean could be responsible for as much as 10% of the value currently estimated for total global ocean CO<sub>2</sub> uptake.

**Proceedings of the Ocean Climate Data Workshop, February 18-21, 1992**, 1992      **Oceania** Alfred Reginald

Radcliffe-Brown, Raymond Firth, Adolphus Peter Elkin, 1999      **Real-time Coastal Observing Systems for Marine Ecosystem Dynamics and Harmful Algal Blooms** Babin, Marcel, Roesler, Collin S., Cullen, John J., 2008-06-05 The proliferation of harmful phytoplankton in marine ecosystems can cause massive fish kills contaminate seafood with toxins impact local and regional economies and dramatically affect ecological balance Real time observations are essential for effective short term operational forecasting but observation and modelling systems are still being developed This volume provides guidance for developing real time and near real time sensing systems for observing and predicting plankton dynamics including harmful algal blooms in coastal waters The underlying theory is explained and current trends in research and monitoring are discussed Topics covered include coastal ecosystems and dynamics of harmful algal blooms theory and practical applications of in situ and remotely sensed optical detection of microalgal distributions and composition theory and practical applications of in situ biological and chemical sensors for targeted species and toxin detection integrated observing systems and platforms for detection diagnostic and predictive modelling of ecosystems and harmful algal blooms including data assimilation techniques observational needs for the public and government and future directions for research and operations      *The Global Coastal Ocean - Processes and Methods* Kenneth H. Brink, Allan R. Robinson, 2005      *American Book Publishing Record* ,2000      *Bulletin of the Scripps Institution of Oceanography, La Jolla, California* Scripps Institution of Oceanography, 1999      Explorations ,2002      新潟県立大学・佐藤 潤 Niigata Daigaku. Sado Rinkai Jikkenjo, 1995

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