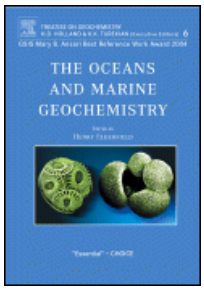
Journal of Sedimentary Research
An International Journal of SEPM
Colin P. North and Kitty L. Milliken, Editors
A.J. (Tom) van Loon, Associate Editor for Book Reviews
Review accepted 22 March 2007



The Oceans and Marine Geochemistry, edited by Henry Elderfield, 2006. Treatise on Geochemistry, vol. 6. Elsevier-Pergamon, The Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, UK. Paperback, 646 pages. Price GBP 57.00; USD 89.00; EUR 80.00. ISBN: 978-0-08-045101-5.

The ocean plays a key role in the interactions among the Earth's external shells (lithosphere, biosphere, atmosphere), and its composition is important to our understanding of how the Earth has evolved through time. The first major work on marine geochemistry, Chemical Oceanography (Riley and Skirrow, 1965), appeared as a result of the rapid scientific progress in the geochemistry after World War II. This pioneering summary, focused almost exclusively on the modern ocean, is now out of date. The new high-tech era in ocean exploration—characterized by the usage of precise satellite navigation, manned and remotely-operated submersibles, and ocean drilling—started in the late 1960s. Many innovations in analytical and sampling technologies have, in combination with the expansion of a new generation of geochemists, produced valuable high-quality data sets, which have led to many new insights into fundamental geochemical problems. Major ocean expeditions have revealed how the oceanic biotas, ocean dynamics, sedimentation and processes at the plate boundaries control and have controlled the composition of the seawater. It was time, therefore, for a new and comprehensive summary of marine geochemistry.

This new book, *The Oceans and Marine Geochemistry*, edited by the distinguished marine geochemist, Prof. Henry Elderfield, appears as volume 6 of the book series *Treatise on Geochemistry* (with H.D. Holland and K.K. Turekian as Executive Editors). Prof. Elderfield has assembled an excellent team of leading scientists, each one being ace in his field. The series of twenty-one outstanding essays they have written cover all the main facets of marine geochemistry, ranging from the modern ocean composition (Chapters 1–6) and transport processes and fluxes in the ocean (Chapters 7–11) to paleoclimatology and paleoceanography problems (Chapters 12–21). They clearly demonstrate how dramatically this science has advanced since the last major work 40 years ago.

Chapter 1 reviews how the composition of the major components of seawater controls the rates and equilibria of processes in the oceans. The reader gains a first-order understanding of the major controls of trace metals in seawater (Chapter 2) developed from the extensive research on trace metals over the last decades. He will gain an insight into many of the processes affecting trace-metal cycling within the oceans, which has revealed many interesting questions still to be answered. The cycling of gases in surface oceans, including the thermocline, and particularly the exchange of various volatile compounds across the air/sea interface are thoroughly discussed (Chapter 3). The biological pump that heavily influences the cycling, concentrations, and residence times of a number of elements is considered in Chapter 4. By focusing on a molecular elucidation of key biochemical processes in the marine biogeochemical cycles of elements, Chapter 5—dedicated to marine bioinorganic chemistry—helps us understand the complex interdependence of marine life and ocean geochemistry, and how they have evolved together over

the history of the Earth. Chapter 6 summarizes main aspects of our current understanding of the organic carbon cycle as it pertains to the contemporary ocean, including underlying surficial sediments.

A synthesis of the current understanding of the impact of submarine hydrothermal activity on marine geochemistry is provided in Chapter 7. This brief synopsis aims to elucidate the main facets of vent-fluid geochemistry, hydrothermal plume processes, and hydrothermal deposits. An overview of recent advances in the use of tracers to measure ocean mixing, circulation, and ventilation is provided in Chapter 8. The usage of natural radionuclides triggered the recent progress in understanding the importance of the transport and transformation of particulate matter in the ocean (Chapter 9). Although Chapter 10 seems to overlap considerably with Chapters 4 and 19, it represents the point of view of a geochemical ocean modeler, who attempts to integrate new field observations into the context of the ocean control of the pCO_2 of the atmosphere. The evolution of the understanding of processes of diagenesis and burial of the chemical elements that make up the bulk of the particulate matter that reaches the seafloor is thoroughly discussed (Chapter 11).

Geochronometry of marine deposits (Chapter 12), geochemical tracers for Quaternary sea-level changes (Chapter 13), geochemical proxies of past ocean temperatures (Chapters 14, 15) and tracers of past ocean circulation (Chapter 16), long-lived isotopic tracers in paleoceanography and ice-sheet dynamics (Chapter 17), the biological pump in the past (Chapter 18), the cycle of oceanic $CaCO_3$ (Chapter 19), and the geological history of seawater chemistry (Chapters 20, 21) give basic knowledge of paleoclimatology and paleoceanography.

In one sentence, this is a concisely and clearly written, truly balanced book, well illustrated by excellent diagrams and graphs, that summarizes the essentials of contemporary knowledge of the geochemistry of ocean. It is The New Testament in marine geochemistry.

I would not say just I strongly recommend this book. The book is a must for any scientific library, for any student who wants to enter the amazing world of marine geochemistry, and for any scientist who wishes to improve his knowledge of topics beyond his own area of expertise. Non-professionals will find in this book all information they need about widely discussed problems like global warming, composition and history of seawater, the natural removal of toxins, etc.

Vesselin Dekov
Dept. of Geology & Paleontology
University of Sofia
15 Tzar Osvoboditel Blvd.
1000 Sofia
Bulgaria
e-mail: dekov@gea.uni-sofia.bg

SEPM - The Society for Sedimentary Geology