

Chapter 1

Introduction to the Guide

The collection of extensive, reliable, oceanic carbon data was a key component of the Joint Global Ocean Flux Study (JGOFS) and World Ocean Circulation Experiment (WOCE) and continues to be a cornerstone of the global climate research effort. This Guide was originally prepared at the request, and with the active participation, of a science team formed by the U.S. Department of Energy (DOE) to carry out the first global survey of carbon dioxide in the oceans (DOE, 1994. Handbook of methods for the analysis of the various parameters of the carbon dioxide system in sea water; version 2, A.G. Dickson and C. Goyet, Eds. ORNL/CDIAC-74). The manual has been updated several times since, and the current version contains the most up-to-date information available on the chemistry of CO₂ in sea water and the methodology of determining carbon system parameters. This revision has been made possible by the generous support of the North Pacific Marine Science Organization (PICES), the International Ocean Carbon Coordination Project (IOCCP) co-sponsored by the Scientific Committee on Ocean Research (SCOR) and the Intergovernmental Oceanographic Commission (IOC) of UNESCO, and the Carbon Dioxide Information Analysis Center (CDIAC). The editors are extremely grateful to Alex Kozyr and Mikhail Krassovski at CDIAC for their hard work in helping us to complete this revised volume. This manual should be cited as Dickson, A.G., Sabine, C.L. and Christian, J.R. (Eds.) 2007. Guide to best practices for ocean CO₂ measurements. PICES Special Publication 3, 191 pp.

The procedures detailed in the following pages have been subjected to open review by the ocean carbon science community and describe well-tested methods. They are intended to provide standard operating procedures (SOPs), together with an appropriate quality control plan. These are not the only measurement techniques in use for the parameters of the oceanic carbon system; however, they do represent the current state-of-the-art for shipboard measurements. In the end, we hope that this manual can serve as a clear and unambiguous guide to other investigators who are setting up to analyze the various parameters of the carbon dioxide system in sea water. We envision it as an evolving document, updated where necessary. The editors welcome comments and suggestions for use in preparing future revisions. The procedures included

here are not simply descriptions of a particular method in current use in a single laboratory, but rather provide standard operating procedures which have been written in a fashion that will—we trust—allow anyone to implement the method successfully. In some cases there is no consensus about the best approach; these areas are identified in the footnotes to the various procedures along with other hints and tips.

In addition to the written procedures, general information about the solution chemistry of the carbon dioxide system in sea water has been provided (Chapter 2) together with recommended values for the physical and thermodynamic data needed for certain computations (Chapter 5). This information is needed to understand certain aspects of the procedures, and users of this Guide are advised to study Chapter 2 carefully. The user is cautioned that equilibrium constants employed in ocean carbon chemistry have specific values for different pH scales, and values in the published literature may be on different scales than the one used here; it is very important to make sure that all constants used in a particular calculation are on the same scale. General advice about appropriate quality control measures has also been included (Chapter 3). The SOPs (Chapter 4) are numbered. Numbers less than 10 are reserved for procedures describing sampling and analysis, numbers 11–20 for procedures for calibration, *etc.*, and numbers 21 and upward for procedures for computations and quality control. This scheme allows for the addition of further SOPs in the future. Each of the procedures has been marked with a date of last revision and a version number. When citing a particular SOP in a report or technical paper, we recommend stating the version number of the procedure used. We envision this Guide being further expanded and updated in the future; thus the version number identifies unambiguously the exact procedure that is being referred to. Any errors in the text or corrections that arise as the methods evolve can be reported to Alex Kozyr at CDIAC (kozyra@ornl.gov).

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Editors