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Introduction to the handbook

The collection of extensive, reliable, oceanic carbon data is a key component of the Joint Global Ocean Flux Study (JGOFS). A portion of the U. S. JGOFS oceanic carbon dioxide measurements will be made during the World Ocean Circulation Experiment (WOCE) Hydrographic Program with funding from the U. S. Department of Energy (DOE) Special Research Grant Program 89-7A: Global survey of carbon dioxide in the oceans. A science team has been formed from the investigators supported by the DOE to plan and co-ordinate the various activities needed to produce high quality oceanic carbon dioxide measurements under this program.

This handbook was prepared at the request of, and with the active participation of, that science team. The procedures detailed in the following pages have been agreed on by the members of the science team and describe well tested-methods. They are intended to provide standard operating procedures (SOPs), together with an appropriate quality control plan, for measurements made as part of this survey. 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 handbook can serve widely 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, much in the fashion of a computer manual. The editors will welcome comments and suggestions for use in preparing future revisions.

The procedures described 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 any chemist to implement the method successfully. On occasion some lack of consensus about the best approach still remains; these areas are identified in the footnotes to the various procedures amongst other hints and tips. We are in the process of conducting collaborative studies of the various methods described here to assess whether or not such differences are significant. The results of such studies will be cited in this handbook once they have been reported.

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 handbook are advised to study Chapter 2 carefully. 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, quality control, *etc*. This scheme allows for the addition of further SOPs in the future. Each of the procedures has been marked with a date of printing 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 conceive of this handbook as being expanded and updated; thus the version number identifies unambiguously the exact procedure that is being referred to.