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The U.S. WOCE Office (USWO) at Texas A&M University was established to carry out the necessary coordination both within the U.S. and between the U.S. and international partners to permit successful implementation of this multi-national project. It has been funded by a number of federal funding agencies, including the National Science Foundation (NSF), the National Oceanic and Atmospheric Administration (NOAA), the Office of Naval Research (ONR), the National Aeronautic and Space Administration (NASA), the Department of Energy (DOE), and the Oceanographer of the Navy. This report covers activities of the USWO during the period 1.01.1999-12.31.2000 (a no-cost extension until 9.30.2001 was granted in October 2000, because of the delays occasioned with finalizing payments following a meeting in December 2000).

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World Ocean Circulation Experiment: Support for the U.S. WOCE Office (N00014-99-1-0200)

A Final Report
to
The Office of Naval Research
from
Texas A&M University

Worth D. Nowlin, Jr.
Principal Investigator

September 2001

1. Introduction

The U.S. WOCE Office (USWO) at Texas A&M University was established to carry out the necessary coordination both within the U.S. and between the U.S. and international partners to permit successful implementation of this multi-national project. It has been funded by a number of federal funding agencies, including the National Science Foundation (NSF), the National Oceanic and Atmospheric Administration (NOAA), the Office of Naval Research (ONR), the National Aeronautic and Space Administration (NASA), the Department of Energy (DOE), and the Oceanographer of the Navy. This report covers activities of the USWO during the period 1.01.1999-12.31.2000 (a no-cost extension until 9.30.2001 was granted in October 2000, because of the delays occasioned with finalizing payments following a meeting in December 2000).

2. Specific Responsibility of the U.S. WOCE Office

Specific responsibilities of the U.S. WOCE Office have been agreed between federal agencies and the Principal Investigator as follows:

1. Provide support for U.S. WOCE activities through:
   - Preparing position papers and other documentation with respect to the efforts of the individual WOCE components and the panels and working groups of the Science Steering Committee (SSC).
   - Coordinating travel and meeting arrangements for scientists attending meetings of the panels and working groups mentioned above.
   - Compiling and maintaining records detailing the progress of the individual funded research projects that make up U.S. WOCE.
   - Coordinating between the individual research projects in the acquisition and use of shared facilities, and the distribution of information about and data obtained by WOCE field activities.
   - Coordinating and exchanging information with international WOCE partners.
   - Coordinating and exchanging information with other global change research programs.
   - Maintaining a public information program.

2. Provide support for the International Project Office for WOCE (IPO) through:
   - Coordinating travel arrangements and providing financial support for U.S. participants in international WOCE panel and working group meetings.
   - Providing technical and managerial assistance through the financial support of consulting personnel and printing costs.

3. Provide additional support as shall from time-to-time be agreed between NSF or other agencies and the Principal Investigator, when requested by the agency.

4. Perform other tasks within the same general scope of work following community review and agency approval of unsolicited proposals.

3. Funding

During the period under review, the ONR provided $55,730 to the USWO for the purpose of supporting travel of U.S. participants at WOCE-related meetings within the U.S. and overseas. Of this, $15,730 was reserved for a meeting in Washington, D.C., held on 10 February 2000 at the offices of the Consortium for Oceanographic Research and Education,

on the topic of Economic Benefits of an Integrated Ocean Observing System. The final report of this meeting was sent to ONR on May 4, 2000.

4. Report for the period January 1999-December 2000

The tasks of the U.S. WOCE Office (USWO) can be summarized under the following seven headings:

Preparation of Position Papers and Other Documents

The USWO prepares position papers for the U.S. WOCE Science Steering Committee (SSC) and the U.S. WOCE Interagency Panel (IAP) to evaluate the progress of U.S. WOCE components, to define areas lacking adequate support, and to set priorities for future work. During the period under review, the USWO produced:

- Three reports on U.S. WOCE data availability;
- A review of ongoing atlas preparations;
- A review of ongoing synthesis activities;
- A report on the Data Products Committee meeting of April, 1999
* A report on the continuing need for deep water hydrographic surveys

Additionally, the USWO produced two annual reports (#11 and #12). The 1999 report (#11) included a survey of WOCE Achievements, designed to portray some of the most notable cross-cutting results from the program in a format understandable by all oceanographers, not just those specializing in physical oceanography.

Two meeting of the SSC took place during this review period. The USWO made all the arrangements for these meetings and prepared the necessary documents. Additionally, office staff carried out many action items resulting from the above meetings.

The USWO Director gave a talk on development and achievements of WOCE at a meeting of the NRC Climate Research Committee, in Washington, D.C., in September 1999.

Coordination of Meeting and Travel Arrangements

The USWO supports the travel expenses of U.S. scientists to domestic and international WOCE meetings and to other meetings in which WOCE has an interest. A list of meetings at which scientists and USWO staff were supported during the review period is given in Appendix I. The USWO also puts on various WOCE meetings within the U.S. Meetings arranged wholly by the USWO during this review period include the following:

- Velocity workshop (Dallas, 1/99)
- U.S. WOCE SSC meeting (Dallas, 1/99)
- Workshop on variability of northern Indian Ocean (Miami, 5/99)
- Velocity workshop follow-up meeting (Boulder, 7/99)
- U.S. WOCE SSC meeting (Houston, 2/00)
- WOCE Data Products Committee meeting (College Station, 4/00)

In addition, the USWO provided funding for logistical support of meetings organized at other institutions within the U.S.

Maintenance of records of U.S. WOCE Proposals

The USWO maintains a data base of proposals submitted to agencies for U.S. WOCE funding. Information on active and completed proposals includes data on funding, progress reports, and published articles resulting from the research. Proposals not funded are removed from the active files and archived. The data base presently contains over 500 proposals. The USWO continued to work with the federal funding agencies to improve its information on WOCE proposals and to obtain information on proposals important to WOCE but funded through other programs.

To encourage synthesis activity and ensure PIs are aware of what is happening, abstracts for all U.S. proposals funded as part of AIMS are published on the USWO website. Abstracts for several overseas projects also have been received from the PIs and are posted or linked.

Coordination Between Individual Research Projects Via Shared Facilities

The USWO continues to share information on U.S. WOCE research with the International Project Office (IPO) in the United Kingdom, the WOCE Data Information Unit at the University of Delaware, and individual Data Assembly Centers (DACs). Most information exchange takes place electronically, and the USWO home page on the World-Wide Web is linked directly with many other WOCE sites.

Coordination and Information Exchange with International WOCE Partners

Much of the international WOCE business is conducted during meetings of the international Scientific Steering Group (SSG) and its panels and working groups. During 1999-2000, the USWO supported the attendance at these meetings of U.S. scientists (Appendix I). Additionally, the USWO assisted with arrangements for international WOCE meetings conducted in the U.S. (see above). The Director of the USWO attended and made presentations at many of these meetings.

Coordination and Information Exchange with Other Global Change Programs

USWO staff continue to communicate with scientists and agency personnel involved in other global change programs to coordinate research of mutual interest. During 1999/00, the USWO was active in support of CLIVAR, and the Director attended meetings of the U.S. CLIVAR SSC as well as joint WOCE/CLIVAR workshops.

Maintenance of a Public Information Program

Documents published by the USWO during the review period are listed in Appendix II. Because of competition with the International WOCE newsletter, and because WOCE is winding down, production of the newsletter, *WOCE Notes*, was discontinued in early 2000. However, use of the USWO home page on the World-Wide Web helped ensure that scientists, agency managers, and the public remained informed of U.S. WOCE activities.

Additional synthesis activities

While many aspects of the WOCE synthesis phase can be accommodated through "business as usual," some, such as the preparation of atlases (of whatever type), climatologies, and certain aspects of modeling and data assimilation, require more oversight. An international WOCE committee was established in 1999 to formulate the requirements for a WOCE atlas series, and following funding of the printing costs by BP, the USWO Director has been appointed scientific editor of the series

At the SSC meeting in January 1999, it was agreed to hold a workshop for young investigators, both to introduce them to the WOCE datasets and to encourage new

researchers to submit proposals to use them. The USWO worked with Drs Haidvogel and Wunsch on the logistics of such a workshop. A proposal to NASA to fund two workshops was supported, and the first took place in summer 2000 at NCAR.

Given the ramping down of WOCE, the assembly and archiving of the data sets gathered during the program is of vital importance. The USWO has been active in several ways in encouraging PIs to submit their data to the Data Assembly Centers (DACs). Funds were provided for PIs to attend basin meetings where calibration of different data sets can take place, and the USWO Director was active in approaching PIs and convincing them to submit data to the DACs. Additionally, the USWO has continued to support the attendance of U.S. members at meetings of WOCE data committees.

5. International WOCE Office (Southampton, U.K.)

The USWO has continued its support of the IPO (situated at the Southampton Oceanography Centre, England) both by providing travel support for U.S. members on international WOCE panels (Appendix I) and by supporting a consultant at the International Office. Additionally, the USWO provided assistance with arrangements for meetings of international panels conducted in the U.S.; during the review period these comprised the meetings of the international WOCE SSG, the Data Products Committee, the joint WOCE/CLIVAR Ocean Model Development Working Group, and an international workshop on the Indian Ocean (see Appendix I).

The consultant (Dr. Peter Saunders) continued to work with the IPO on specific issues connected with modeling and synthesis. The Consultant has the responsibility of advising the Chairman of the SSC and the WOCE IPO Director on:

- the status of development and testing of global ocean models required for climate prediction, with specific emphasis on basin- and global-scale models that use data collected during WOCE;
- appropriate data products that should be produced by the WOCE Special Analysis Centers;
- the status of the development, testing, assembly and production of integrated data products from both the WOCE Special Analysis Centers and the general scientific community;
- progress being made within other global oceanographic and atmospheric programs that may impact modeling and data analysis undertaken through WOCE; and
- the status of publications detailing research carried out with WOCE support.

Appendix I – Meetings at which attendees were supported by USWO during the period 1/99-12/00

Jan. 4-5, 1999	U.S. WOCE Velocity Workshop (Dallas, TX)
Jan. 6-8, 1999	U.S. WOCE SSC Meeting (Dallas, TX)
Feb. 22-26, 1999	International WOCE Tracer Workshop (Bremen, Germany)
March 13-20, 1999	International WOCE SSG Executive and JSC Meeting (Kiel, Germany)
April 12-15, 1999	International WOCE Data Products Committee (Bidston, England)
May 10-11, 1999	International WOCE Northern Indian Ocean Workshop (Miami, FL)
July 27-28, 1999	U.S. WOCE Velocity Workshop II meeting (Boulder, CO)
Oct. 5-7, 1999	International WOCE SSG meeting (La Jolla, CA)
Oct. 18-22, 1999	International OOPC meeting (San Rafael, France)
Jan. 24-28, 2000	Ocean Sciences meeting (San Antonio, TX)
Feb. 10, 2000	Economic Benefits of an Integrated Ocean Observing System (Washington, D.C.)
Feb. 24-25, 2000	U.S. WOCE SSC meeting (Houston, TX)
March 2-4, 2000	International WOCE Ocean Modeling Development Working Group (Miami, FL)
April 5-7, 2000	International WOCE Data Products Committee meeting (College Station, TX)
Oct. 21-24, 2000	International WOCE WOCE Variability meeting (Fukuoka, Japan)
Oct. 25-26, 2000	International WOCE SSG Meeting (Fukuoka, Japan)
Dec 17-21, 2000	AGU Meeting (San Francisco, CA)

Appendix II - Publications of U.S. WOCE Office during the period

WOCE Accomplishments (U.S. WOCE Implementation Report #11). September 1999, 28 pp.

U.S. WOCE Implementation Report #12, August 2000, 56 pp.

WOCE Notes

- 11(1) June 1999, 24 pp.
- 12(1) February 2000, 20 pp.

P. Chapman The Quality Control of VOS XBT Data. (Prepared for the February 2001 Meeting of the U.S. WOCE SSC, San Francisco), 5 pp.

C. Sabine, R. Feely, P. Chapman, R. Fine, G. Johnson and S. Doney. The Need for Continuing Global Deep-Ocean Surveys. Background paper prepared for the U.S. WOCE SSC and the NOAA CO_2 Observations Program, Boulder, CO, November 2000. 20 pp

Other papers published or given at conferences by the USWO Director and Dr W.D. Nowlin, Jr

Chapman, P. and W. D. Nowlin, Jr., (2000). Ocean Data Synthesis Offer Research Opportunities. EOS 81 (10), 102, 107.

Chapman, P., Reap M.R. and Nowlin, W.D. (2000). From Regional to Global Oceanography – the World Ocean Circulation Experiment. AGU Fall Meeting, San Francisco. EOS 80 (48) Supplement, OS21D-01.

Di Marco, S.F., P. Chapman. and W. D. Nowlin, (2000). Satellite observations of upwelling on the continental shelf south of Madagascar. Geophys. Res. Lett. 27, 3965-3968

Di Marco, S.F. and Chapman, P. (2000). Flow at Intermediate Depths around Madagascar. AGU Fall Meeting, San Francisco. EOS 80 (48) Supplement, OS71B-08.

Nowlin, W. D., N. Smith, E Harrison, C. Koblinsky and G. Needler. (1999). An integrated, sustained ocean observing system. Proceedings of the First international conference on ocean observing systems for climate, San Raphael, France, 18-22 October 1999. Submitted for book.

Nowlin, W. D. (1999). Principles of GOOS Capacity Building, IOC informal document.

Nowlin with Ocean Observations Task Team. (1999). Towards a U.S. Plan for an Integrated, Sustained Ocean Observing System. A report prepared for the National Ocean Research Leadership Council of the National Oceanographic Partnership Program. Washington, DC, 68 pp.