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Entered 10-22-97
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DOE/ER/61404--1-VOL. 1

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NATIONAL SCIENCE FOUNDATION FINAL PROJECT REPORT

PART I - PROJECT IDENTIFICATION INFORMATION	
1. Program Official/Org.	<i>Richard Lambert - OCE</i>
2. Program Name	<i>PHYSICAL OCEANOGRAPHY</i>
3. Award Dates	From: <i>01/01/92</i> To: <i>09/30/97</i>
4. Institution and Address	<i>Texas A&M Research Foundation Texas A&M Research Fdn Box 3578 College Station, TX 77843</i>
5. Award Number	<i>9105742</i>
6. Project Title	<i>World Ocean Circulation Experiment: Support for the U.S. WOCE Office</i>

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PART II - SUMMARY OF COMPLETED PROJECT

During the period 1.1.92 - 9.30.97 the U.S. WOCE Office continued the coordination of the U.S. component of the World Ocean Circulation Experiment. The experiment, the largest oceanographic research program ever formulated, seeks to improve our knowledge of and ability to predict changes in ocean climate over periods of decades or longer. More than 100 U.S. principal investigators are supported in WOCE research by five federal funding agencies. The U.S. WOCE Office has maintained a database on the program, published information about and results from WOCE, liaised with both the International WOCE Project Office in the U.K., with scientists in other participating countries and with other programs within the U.S. GCRP, organized scientific and implementation meetings, and provided travel support for U.S. scientists attending them. Additional major activities during the period of the award included the organization of a multi-leg oceanographic expedition to the Indian Ocean, the coordination of planning for WOCE research in the North Atlantic (the Atlantic Circulation and Climate Experiment), and planning for the synthesis phase of the program, due to continue through at least 2002.

PART III - TECHNICAL INFORMATION

U.S. WOCE Implementation Reports 4-9 (1992-1997)

U.S. WOCE Newsletter (WOCE Notes) 4(1) - 9(1); 18 issues 1992-1997

U.S. WOCE Planning Reports

U.S. Contribution to WOCE Core Project 1 The Program Design for the Indian Ocean. Draft Version 1 (July 1992)

U.S. Contribution to WOCE Core Project 1 The Program Design for the Indian Ocean. Draft Version 2 (August 1992)

U.S. Contribution to WOCE Core Project 1; The Program Design for the Indian Ocean. Draft Version 3 (November 1992)

U.S. Contribution to WOCE Core Project 1; The Program Design for the Indian Ocean. Draft Version 4 (February 1993)

U.S. Contribution to WOCE Core Project 1; The Program Design for the Indian Ocean. Draft version I1 (August 1993)

Update on Plans for Indian Ocean (October 1993)

Update on Plans for Indian Ocean (December 1993)

Update on Plans for Indian Ocean (February 1994)

Update on Plans for Indian Ocean (May 1994)

U.S. Contribution to WOCE and ACCP

A Program Design for the Atlantic Ocean ;Version 1 (July 1994)

U.S. Contribution to WOCE and ACCP

A Program Design for the Atlantic Ocean ;Version 2 (November 1994)

Update on Plans for Indian Ocean (December 1994)

U.S. Contribution to WOCE and ACCP

A Program Design for the Atlantic Ocean ;Version 3 (February 1995)

Update on Plans for Indian Ocean (May 1995)

Update on Plans for Indian Ocean (June 1995)

Update on Plans for Indian Ocean (October 1995)

Update on Plans for Indian Ocean (February 1996)

Update on Plans for ACCE (February 1996)

U.S. O-CLIVAR Implementation Planning Report ; Version 2 (September 1996)

U.S. O-CLIVAR Implementation Planning Report ; Version 3 (October 1996)

U.S. WOCE Synthesis Plan (December 1996)

U.S. WOCE Office reports/documents

Report of the Planning Meeting for U.S. WHP Survey in the Indian Ocean held 12 - 15 November 1991 in Miami, Florida. (January 1992)

Report on U.S. WOCE Office as part of ongoing climate research programs for the Texas Center for Climate Studies. (February 1992)

Press Release on opening of U.S. WOCE Interagency Office in Washington, D.C. Carried by EOS, Trans. Amer. Geophys. Union, 73(21), 26 May 1992, pg. 235.

Report of U.S. WOCE Science Steering Committee Meeting, held 2- 4 June 1992 in Seattle, Washington. (June 1992)

Report on the U.S. WOCE Office's international relations for the TAMU

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International Program's Enhancement and Coordination Committee. (July 1992)

Notes on U.S. WOCE Science Steering Committee Executive Meeting, 10-11 September 1992, Washington, D.C. (October 1992).

WOCE Data Availability Report (November 1992).

Report on U.S. WOCE Office's international relations for the TAMU International Program's Enhancement and Coordination Committee (November 1992).

U.S. WOCE Communications Review (February 1993).

Report of U.S. WOCE Science Steering Committee Meeting, 9-12 February 1993, Garrett Creek Ranch, Texas (May 1993).

Assessment of Progress towards meeting U.S. WOCE Goals (May 1993).

Report on U.S. WOCE Office's international relations for the TAMU International Program's Enhancement and Coordination Committee (July 1993).

Report of Planning Meeting for U.S. WHP Survey in the Indian Ocean, 2-4 August 1993 in La Jolla, CA (September 1993)

Notes on U.S. WOCE Science Steering Committee Executive Meeting, 5 August 1993, La Jolla (September 1993).

Meeting Report from SSC October 20-22, 1993 Meeting, Albuquerque, NM (November 1993)

SSC Document on Potential Funding Profile for U.S. WOCE, 1990-2005 (Presented at SSC Meeting, November 1993)

WOCE Synthesis Phase: Tentative Outline of Planning Report (Presented at SSC Meeting, November 1993)

WOCE Proposal Reviews (Presented at SSC Meeting, February 1994)

Draft WOCE Synthesis Phase Planning Report Outline (Presented at SSC Meeting, February 1994)

Meeting Report from SSC February 18-19, 1994 Meeting, Dallas, TX (March 1994)

Joint WOCE/ACCP North Atlantic Meeting Documents (April 1994)

Joint WOCE/ACCP North Atlantic Meeting Report, Princeton, 11-13 May 1994 (June 1994)

Documents for SSC Meeting November 1-4, 1994 (October 1994)

Meeting Report from SSC November 1-4, 1994 Meeting, College Station, TX (November 1994)

Meeting Report from SSC November 1-4, 1994 Meeting, College Station, TX (November 1994)

Documents for ACCE Meeting February 21-23, 1995 in Atlanta, GA (February 1995)

Meeting Report from ACCE Meeting February 21-23, 1995 (March 1995)

Documents for SSC Meeting September 12-15, 1995 (September 1995)

Meeting Report from SSC September 12-15, 1995 Meeting, Seattle, WA (September 1995)

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NASLGC Report (November 1995)

WOCE Proposal Reviews (February 1996)

**WOCE Pacific Workshop Registration Information ; August 19-23, 1996
(February 1996)**

Documents for O-CLIVAR Meeting June 10-13, 1996 (June 1996)

Abstracts document for Pacific Workshop (August 1996)

Documents for SSC Meeting August 27-29, 1996 (August 1996)

**Meeting Report from SSC August 27-29, 1996 Meeting, Washington, D.C.
(October 1996)**

Documents for SSC Meeting January 22-23, 1997 (January 1997)

**Documents for Ocean Data Assimilation Meeting February 20-21, 1997
(February 1997)**

Meeting Report from SSC January 22-23, 1997 Meeting, Dallas (March 1997)

Meeting Report from ODA February 20-21, 1997 Meeting, Dallas (March 1997)

**Documents for Ocean Global Circulation Modeling Meeting April 7-8, 1997
(March 1997)**

Meeting Report from OGCM April 7-8, 1997 Meeting, Boulder (May 1997)

**Meeting Report from BECS Planning Meeting September 15-16, 1997 (October
1997)**

Documents for SSC Meeting October 6-8, 1997 (October 1997)

OOSDP Reports

**Report of the Planning Meeting for U.S. WHP Survey in the Indian Ocean
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D.C. Carried by EOS, Trans. Amer. Geophys. Union, 73(21), 26 May 1992,
pg. 235.**

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**Report on the U.S. WOCE Office's international relations for the TAMU
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September 1992, Washington, D.C. (October 1992).**

WOCE Data Availability Report (November 1992).

**Report on U.S. WOCE Office's international relations for the TAMU
International Program's Enhancement and Coordination Committee (November
1992).**

U.S. WOCE Communications Review (February 1993).

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Garrett Creek Ranch, Texas (May 1993).**

Assessment of Progress towards meeting U.S. WOCE Goals (May 1993).

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Documents for SSC Meeting September 12-15, 1995 (September 1995)

Meeting Report from SSC September 12-15, 1995 Meeting, Seattle, WA (September 1995)

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Documents for Ocean Data Assimilation Meeting February 20-21, 1997 (February 1997)

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Meeting Report from ODA February 20-21, 1997 Meeting, Dallas (March 1997)
Documents for Ocean Global Circulation Modeling Meeting April 7-8, 1997 (March 1997)
Meeting Report from OGCM April 7-8, 1997 Meeting, Boulder (May 1997)
Meeting Report from BECS Planning Meeting September 15-16, 1997 (October 1997)
Documents for SSC Meeting October 6-8, 1997 (October 1997)

Publications by Office Director and Project Scientist

Butler, E. C. V., J. A. Butt, E. J. Lindstrom, P. C. Tildesley, S. Pickmere, and W. F. Vincent. 1992. Oceanography of the Subtropical Convergence around southern New Zealand. New Zealand Journal of Marine and Freshwater Research, 26: 131-154.
Butt, J. A. and E. J. Lindstrom. 1994. Currents off the east coast of New Ireland, Papua New Guinea and their relevance to regional undercurrents in the Western Equatorial Pacific Ocean. J. Geophys. Res., 99: 12503-12514.
Chapman, P. 1993. Review of 'Upwelling Systems: Evolution since the Early Miocene', C. P. Summerhayes, W. L. Prell and K. C. Emeis, eds. Geochimica et Cosmochimica Acta, 57: 4326-4327.
Chapman, P. 1993. Planned International Oceanographic Programmes in the Indian Ocean, 1993-1996. IOMAC Bulletin, 1: 4-6.
Chapman, P. 1993 The U.S. WOCE Program: progress towards scientific objectives. Ocean News, 1: 2.
Chapman P. 1994 Indian Ocean plans continue to evolve. International WOCE Newsletter 16 (July 1994): 18-20.
Chapman, P. 1996. Review of 'Upwelling in the Ocean: Modern Processes and Ancient Records,' C.P. Summerhayes, K.-C. Emeis, M.V. Angel, R.L. Smith and B. Zeitzschel, eds. Limnol. Oceanogr., 41(7): 1585-1586.
Chapman, P., S. Doney, E. Howell, and D. Olson. 1996. Nutrient relationships in the northern Indian Ocean. Ocean Sciences Meeting, San Diego. EOS 76(3): OS12B-16.
Chapman, P., Doney, S. and Olson, D. (1997). Nutrient relationships in the northern Indian Ocean. Paper presented at IAPSO/IAMAP Joint Assembly, Melbourne, Australia, 1-9 July 1997.
Chapman, P. and C. T. Hill. 1996. World Ocean Circulation Experiment ; Studying the Ocean's Role in Climate Change. Quarterdeck, 4: 3-6.
Chapman, P. and E. J. Lindstrom. 1994. Per la previsione dei cambiamenti climatici il World Ocean Circulation Experiment . Sistema Terra, 3: 47-50.
Chapman, P., B. Mitchell-Innes, and D. R. Walker. 1994. Microplankton ETS respiration as a means of assessing respiration in the Benguela Current region. South African Journal of Marine Science, 14: 297-312.
Chapman, P. and E. Lindstrom. 1994. U.S. World Ocean Circulation Experiment: Making Progress towards Understanding Ocean Circulation. Ocean

PART III - TECHNICAL INFORMATION

(Page 6 of TECHNICAL INFORMATION)

Sciences Meeting, San Diego. EOS, 75 (3): 224.

Chapman, P. and Nowlin, W.D. Jr. 1997. The World Ocean Circulation Experiment (WOCE): An Ocean Climatology for the 1990s. Eighth Symposium on Global Change Studies, Long Beach, Preprints volume, pp 154-161.

Farrenkopf, A. M., G. W. Luther, and P. Chapman. 1996. Reduced iodine reflects productivity and denitrification in the Arabian Sea. Ocean Sciences Meeting, San Diego. EOS 76(3): OS11A-11.

Inaba, H., K. Yasuda, K. Kutsuwada, T. Oishi, K. Kawabata, H. Moriya, and E. Lindstrom. 1992. Continuous observation in the ocean mixed layer with moored current meters. Annual Report of the Japanese Pacific Climate Studies (JAPACS) 1991, Research and Development Bureau, Science and Technology Agency, Japan.

Kindle, J., S. Murray, and E. Lindstrom. 1996. Interannual Variability of the Low Latitude Western Boundary Current in the South Pacific. Paper Presented in the American Geophysical Union West Pacific Geophysics Meeting, Brisbane, Australia 22-27 July 1996.

Largier, J. L., Chapman, P., Peterson, W. T., and Swart V. P. 1992. The western Agulhas Bank: circulation, stratification, and ecology. South African Journal of Marine Science, 12: 319-339.

Lindstrom, E. 1992. The World Ocean Circulation Experiment: Seeking a description of the ocean's role in global climate change. Proceeding of the Annual Meeting of the Marine Technology Society, pp. 522-527.

Lindstrom, E. 1993. U.S. World Ocean Circulation Experiment: Making progress toward understanding ocean circulation. Proceedings of the Third Scientific Meeting of The Oceanography Society, p. 87.

Lindstrom, E. J. 1995. U.S. World Ocean Circulation Experiment Results from the Pacific Ocean and the TOGA/WOCE Partnership. TOGA Scientific Conference, April 1995.

Lindstrom, E. 1996. Initial Priorities for the Global Ocean Observing System and the Pacific Ocean Buoy Network. Paper Presented in the International Workshop on Ocean Climate Variations from Seasons to Decades with Special Emphasis on Pacific Ocean Buoy Network. Mutsu Japan 29-31 May 1996.

Lindstrom, E. J., H. Bryden, and M. McCartney. 1994. Characteristics and origin of the abyssal water in the New Hebrides Trench and New Caledonia Trough in the South Pacific Ocean. The Oceanography Society, Pacific Basin Meeting (July 1994).

Lindstrom, E., S. Murray, J. Kindle, E. Weeks. 1995. The Transport Through Vitiaz Strait, Papua New Guinea. Paper Presented in the International Workshop on the Throughflow Studies in and around Indonesian Waters, BPPT-JAMSTEC-STA Japan, Jakarta Indonesia 10-12 October 1995.

McCartney, M., E. J. Lindstrom, S. Cunningham, V. Coles, and H. Bryden. 1994. Preliminary results from the WOCE Hydrographic Program expedition along 17°S in the Pacific Ocean. The Oceanography Society, Pacific Basin

PART III - TECHNICAL INFORMATION

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Meeting (July 1994).

Murray, S. P., H. Hurlburt, J. Kindle, E. J. Lindstrom. 1994. The Transport Through Vitiaz Strait, March 1992-April 1993. The Oceanography Society, Pacific Basin Meeting (July 1994).

Murray, S. P., H. Hurlburt, J. Kindle, E. J. Lindstrom, E. T. Weeks, and M. Inoue. 1994. Annual Cycle Transport Through Vitiaz Strait, March 1992-April 1993 - Observations and Model Results. Transactions of the American Geophysical Union, 75: 205.

Murray, S., E. J. Lindstrom, J. Kindle, and E. Weeks. 1995. Transport through the Vitiaz Strait. WOCE Notes. 7(1): 21-23.

Murray, S. P., E. Prager, and E. Lindstrom. 1992. Velocity Structure of the New Guinea Coastal Undercurrent during the SE Monsoon 1991. Transactions of the American Geophysical Union, Ocean Sciences Meeting.

Smythe-Wright, D., P. Chapman, M. Huddleston, P. Saunders, et al. 1994. Evidence for the transport of Brazil Current rings across the South Atlantic to the Agulhas Retroflexion region. Symposium: The South Atlantic: Present and Past Circulation, Bremen, August 1994. Berichte Fach. Geowiss. Univ. Bremen, 52: 144.

Smythe-Wright, D., Chapman, P., Duncombe Rae, C., Shannon, L.V. and Boswell, S. M. (1997). Characteristics of the South Atlantic Subtropical Front between 15°W and 5°E. Deep-Sea Research (in press).

Smythe-Wright, D., A. L. Gordon, and P. Chapman. 1994. CFC-113 shows Brazil Current rings crossing the South Atlantic to the Agulhas Retroflexion region. EOS 75(44): 379.

Smythe-Wright, D., A. L. Gordon, P. Chapman, and M. S. Jones. 1996. CFC-113 shows Brazil eddy crossing the South Atlantic to the Agulhas Retroflexion region. J. Geophys. Res., 101: 885-895.