

CURRICULUM VITAE for Sydney Levitus

April 23, 2013

WORK ADDRESS:

National Oceanographic Data Center
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EDUCATION:

B.S. degree, in Meteorology and Oceanography, School of Engineering & Science,
New York University, 1970

M.S. degree, in Physical Oceanography, School of Engineering & Science, New York
University, 1973

EMPLOYMENT:

1974-1989 Oceanographer
Geophysical Fluid Dynamics Laboratory/NOAA
Princeton, New Jersey

1989-1993 Chief, Product Development Branch
Senior Research Oceanographer
National Oceanographic Data Center/NOAA
Washington, D.C.

1992-present Director, World Data Center for Oceanography
Silver Spring

1993-2013 Chief, NODC Ocean Climate Laboratory,
National Oceanographic Data Center/NOAA
Washington, D.C.

MEMBERSHIPS IN SCIENTIFIC PROFESSIONAL AND LEARNED SOCIETIES:

- 1) American Meteorological Society
- 2) American Geophysical Union
- 3) American Association for the Advancement of Science

AWARDS :

- 1) NOAA Special Achievement Award July 1978
- 2) NOAA Environmental Research Laboratories,
Distinguished Authorship Special Award June 1984
(for *Climatological Atlas of the World Ocean*).
- 3) NOAA Special Achievement Award June 1988
- 4) NOAA Superior Performance Award July 1989
- 5) **NOAA Administrator's Award** Sept. 1991
(For meritorious work in the field of
oceanographic climate research, contributing
to the understanding of global change).
- 6) **Department of Commerce Silver Medal** Oct. 1993
(for contributions to global change research
through oceanographic data archaeology and
rescue).
- 7) **Department of Commerce Silver Medal** Oct. 1995
(for leadership in the production
of World Ocean Atlas 1994).
- 8) **Department of Commerce Gold Medal** Dec. 1998
(for world class scientific contributions
which advanced the understanding of the
climate system and its variability).
- 9) **Department of Commerce Gold Medal** Sep. 2002
(for scientific achievements in ocean climate
studies confirming that the world's oceans
have significantly warmed over the past 50 years.
- 10) **Part of the UNEP Intergovernmental Panel on
Climate Change Panel that was awarded
the Nobel Peace prize** Dec. 2007
- 11) **Elected as a Fellow of the American Association
for the Advancement of Science** for "distinguished
contributions to the field of ocean sciences,
particularly in the areas of data archaeology
and the analysis of the impacts of climate
change on the upper ocean." Dec. 2010
- 12) IOC/IODE 50th Anniversary award for leadership
of the IOC/IODE GODAR project Mar. 2011
- 13) Appointed Adjunct Prof. in the Dept. of
Atmospheric and Oceanic Sciences, U. Maryland Apr. 2011-2012
- 14) IOC award 50th Anniversary award for contributions
to international oceanographic data exchange Jun. 2011
- 15) **NOAA Distinguished Career Award for
"Scientific Achievement"** May 2012

For pioneering climate science work at NOAA computing global ocean heat content
and making oceanographic data available to the scientific community.

MEMBERSHIP ON NATIONAL AND INTERNATIONAL COMMITTEES AND PANELS:

1988-1994 World Ocean Circulation Experiment Data Management Working Group

1988-1990 Intergovernmental Panel on Climate Change: Scientific Assessment. Working Group I, contributing author

1990-1993 Advisory Panel for the NOAA Climate and Global Change Sea Level Program

1990-1992 Scientific Steering Group of the Atlantic Climate Change Program

1990 Planning Committee and Convener of session for the IOC/WMO sponsored "Ocean Climate Data Workshop"

1992-present Member of the NOAA Climate Change Data and Detection Panel (formerly known as Climate and Global Change, Data and Information Management Review Panel)

1992-present Officer of the International Oceanographic Data and Information Exchange (IODE) committee of the Intergovernmental Oceanographic Commission (IOC)

1993-present Project leader for IODE/IOC "Global Oceanographic Data Archaeology and Rescue" Project

1993-1997 American Meteorological Society "Panel on Climate Variability"

1995-2005 Associate Editor for the *Journal of Climate*

1995-2002 Advisor to European Community MEDAR/MEDATLAS project

1995 Intergovernmental Panel on Climate Change, Scientific Assessment: Contributing author

1997 National Academy of Science/National Research Council "NASA Goddard/DAAC Review Panel"

1998 National Academy of Science/National Research Council "NASA JPL/DAAC Review Panel"

1998 National Academy of Science/National Research Council "Climate Research Committee Review Panel of the Climate Observing system"

1998-2002 Climate Variability and Prediction (CLIVAR) Data Task Team

1999-2003 NASA Jet Propulsion Laboratory DAAC User Working Group

2000-present U.S. Argo Science and Implementation Panel

2001-present Project leader for Intergovernmental Oceanographic Commission "World Ocean Database Project"

2001-2002 NASA Aquarius Science Team (Aquarius is a mission to measure sea surface salinity from space)

2004-2007 Lead author for Chapter 5 (Observations: Oceanic Climate Change and Sea Level) of the 4th IPCC Assessment Report

2007-2008 International Steering Committee of the International Conference IMDIS 2008 that was held in Athens (Greece) March 10-12, 2008.

2010 Invited member of UNEP/GEF project "Development of the Methodology and Arrangements for the GEF Transboundary Waters Assessment Programme (TWAP)" - Open Ocean Working Group

2010-pres. ICSU CODATA Data At Risk Task Group (DARTG).

MEMBERSHIP ON NOAA COMMITTEES AND PANELS:

1997 NOAA DEC-CEN Team NESDIS representative

1998 NOAA Council on Long-Term Climate monitoring

2001 NOAA/NESDIS Ocean Climate Services Team (co-chair)

NOAA Climate Change Data and Detection Team Panel

PUBLICATION SUMMARY:

- a) 30 Senior Author- Publications in peer-reviewed scientific journals and books;
- b) 35 Co-author- Publications in peer-reviewed scientific journals and books;
- c) 46 Senior author and/or co-author of NOAA Professional Papers and atlases
- d) 20 UNPUBLISHED REPORTS (non peer-reviewed);
- e) Editor for *World Ocean Database 2001* and *World Ocean Atlas 2001*;
- f) Editor for *World Ocean Database 2005* and *World Ocean Atlas 2005*;
- g) Editor for *World Ocean Database 2009* and *World Ocean Atlas 2009*.

PUBLICATIONS:

- 1)
Friedrich, H., and S. Levitus, 1972: An approximation to the equation of state for sea water. *J. Phys. Oceanogr.*, 2, 514-517.
- 2)
Levitus, S., 1974: Comment on, "A subsurface north Equatorial Countercurrent in the eastern Pacific Ocean", by M. Tsuchiya. *J. Geophys. Res.*, 79, 2757-2758.
- 3)
Levitus, S., and A. H. Oort, 1977: Global analysis of oceanographic data. *Bull Amer. Meteorol. Soc.*, 58, 1270-1284.
- 4)
Ellis, J. S., T. H. Vonder Haar, S. Levitus, and A. H. Oort, 1978: The annual variation in the global heat balance of the earth. *J. Geophys. Res.*, 83, 1958-1962.
- 5)
[Levitus, S., 1982: Climatological Atlas of the World Ocean, NOAA Professional Paper No. 13, U.S. Gov. Printing Office, Wash., D.C., 173pp., w/microfiche attachments.](#)
- 6)
Levitus, S., 1984: Annual cycle of temperature and heat storage in the World Ocean. *J. Phys. Oceanogr.*, 14, 727-746.
- 7)
Levitus, S., 1986: Annual cycle of salinity and salt storage in the World Ocean. *J. Phys. Oceanogr.*, 16, 322-343.

8)

Kraus, E. B., and S. Levitus, 1986: Annual heat and mass flux variations across the Tropics of Cancer and Capricorn in the Pacific. *J. Phys. Oceanogr.*, 16, 1479-1486.

9)

Levitus, S., 1987: A comparison of the annual cycle of two sea surface temperature climatologies of the World Ocean. *J. Phys. Oceanogr.*, 17, 197-214.

10)

Levitus, S., 1987: Rate of change of heat storage in the World Ocean. *J. Phys. Oceanogr.*, 17, 518-528.

11)

Levitus, S., 1987: Meridional Ekman Heat fluxes for the World Ocean and individual ocean basins. *J. of Phys. Oceanogr.*, 17, 1484-1492.

12)

Levitus, S., 1988: Ekman volume fluxes for the World Ocean and individual ocean basins. *J. Phys. Oceanogr.*, 18, 271-279.

13)

Levitus, S., 1988: Decadal and pentadal distributions of hydrographic stations at 1000 m depth for the World Ocean. *Prog. Oceanogr.*, 20, 83-101.

14)

Oort, A. H., S. C. Ascher, S. Levitus, J. P. Peixoto, 1989: New estimates of the Available Potential Energy in the World Ocean. *J. Geophys. Res.-Oceans*, 94, 3187-3200.

15)

Levitus, S., 1989: Interpentadal variability of temperature and salinity at intermediate depths of the North Atlantic Ocean, 1970-74 versus 1955-59. *J. Geophys. Res.-Oceans*, 94, 6091-6131.

16)

Levitus, S., 1989: Interpentadal variability of salinity in the upper 150 m of the North Atlantic Ocean, 1970-74 versus 1955-59. *J. Geophys. Res.-Oceans*, 94, 9679-9685.

17)

Levitus, S., 1989: Interpentadal variability of temperature and salinity in the deep North Atlantic, 1970-74 versus 1955-59. *J. Geophys. Res.-Oceans*, 94, 16125-16131.

18)

Levitus, S., 1990: Interpentadal variability of steric sea level and geopotential thickness of the North Atlantic Ocean, 1970-74 versus 1955-59. *J. Geophys. Res.-Oceans*, 95, 5233-5238.

19)

Trenberth, K. , J. Angell, R. Barry, R. Bradley, H. Diaz, W. Elliott, R. Etkins, C. Folland, R. Jenne, P. Jones, T. Karl, S. Levitus, A. Oort, D. Parker, C. Ropelewski, K. Vinnikov, and T. Wigley, 1991: Working Group I: Observations, in *Greenhouse-Gas-Induced Climatic Change: A Critical Appraisal of Simulations and Observations*, pp. 571-582, Elsevier, New York.

20)

Greatbatch, R., A.F. Fanning, A.D. Goulding, and S. Levitus, 1991: A diagnosis of interpentadal circulation changes in the North Atlantic. *J. Geophys. Res.-Oceans*, 96, 22009-22024.

21)

Levitus, S., and G. Isayev, 1992: A polynomial approximation to the International Equation of State for Seawater. *J. Ocean. Atmos. Tech.*, 9, 705-707.

22)

Levitus, S., M. Conkright, J. L. Reid, R. Najjar, and A. Mantyla, 1993: Global distributions of silicate, nitrate, and phosphate in the World Ocean. *Prog. Oceanography*, 13, 245-273.

23)

Greatbatch, R., A.F. Fanning, A.D. Goulding, A. da Silva, and S. Levitus, 1993: Model-calculated seasonal transport variations through the Florida Straits: A comparison using different wind stress climatologies. *J. Phys. Oceanogr.*, 24, 30-45.

24)

Conkright, S. Levitus, T. Boyer, 1994: World Ocean Atlas 1994, Vol. 1: Nutrients. NOAA Atlas NESDIS 1, U.S. Gov. Printing Office, Wash., D.C., 150 pp.

25)

Levitus, S., T. Boyer, 1994: World Ocean Atlas 1994, Vol. 2: Oxygen. NOAA Atlas NESDIS 2, U.S. Gov. Printing Office, Wash., D.C., 186 pp.

26)

Levitus, S., R. Burgett, T. Boyer, 1994: World Ocean Atlas 1994, Vol. 3: Salinity. NOAA Atlas NESDIS 3, U.S. Gov. Printing Office, Wash., D.C., 99 pp.

27)

Levitus, S., T. Boyer, 1994: World Ocean Atlas 1994, Vol. 4: Temperature. NOAA Atlas NESDIS 4, U.S. Gov. Printing Office, Wash., D.C., pp. 117

28)

Levitus, S., T. Boyer, and J. Antonov, 1994: World Ocean Atlas 1994, Vol. 5: Interannual variability of upper ocean thermal structure. NOAA Atlas NESDIS 5, U.S. Gov. Printing Office, Wash., D.C., pp. 176.

29)

da Silva, A., C. Young, and S. Levitus, 1994: Atlas of Surface Marine Data 1994, Vol. 1: Algorithms and Procedures. NOAA Atlas NESDIS 6, U.S. Gov. Printing Office, Wash., D.C., pp. 83.

30)

da Silva, A., C. Young, and S. Levitus, 1994: Atlas of Surface Marine Data 1994, Vol. 2: Anomalies of Directly Observed Quantities. NOAA Atlas NESDIS 7, U.S. Gov. Printing Office, Wash., D.C., pp. 416.

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da Silva, A., C. Young, and S. Levitus, 1994: Atlas of Surface Marine Data 1994 Vol. 3: Anomalies of Fluxes of Heat and Momentum. NOAA Atlas NESDIS 8. U.S. Gov. Printing Office, Wash., D.C., pp. 413.

32)

da Silva, A., C. Young, and S. Levitus, 1994: Atlas of Surface Marine Data 1994 Vol. 4: Anomalies of Fresh Water Fluxes. NOAA Atlas NESDIS 9. U.S. Gov. Printing Office, Wash., D.C., pp. 308.

33)

da Silva, A., C. Young, and S. Levitus, 1994: Atlas of Surface Marine Data Vol. 5: Miscellaneous Derived Quantities. NOAA Atlas NESDIS 10. U.S. Gov. Printing Office, Wash., D.C., pp. 416.

34)

Levitus, S., J. Antonov, and T. Boyer, 1994: Interannual variability of temperature at a depth of 125 m in the North Atlantic Ocean. *Science*, 266, 96-99.

35)

Reverdin, G., D. Cayan, H. D. Dooley, D.J. Ellett, S. Levitus, Y. DuPenhoat, and A. Dessier, 1994: Surface salinity of the North Atlantic: Can we reconstruct its fluctuations over the last one hundred years. *Prog. in Oceanography*, 33, 303-346.

36)

Karl, T. R., V. E. Derr, D. R. Easterling, C. K. Folland, D.J. Hofmann, S. Levitus, N. Nicholls, D. E. Parker, G. Withee, 1995: Critical issues for long-term climate monitoring. *Climatic Change: Special Issue on Long-term Climate Monitoring*. 31, 185-221.

37)

Isayev, G., and S. Levitus, 1995: A diagnosis of the North Atlantic horizontal and vertical circulation with error estimates. *J. Geophys. Res.*, 100(C4), 6795-6816.

38)

Levitus, S., and J. Antonov, 1995: Observational evidence of interannual to decadal scale variability of the temperature salinity structure of the world ocean. *Climatic Change: Special Issue on Long-term Climate Monitoring*, 31, 495-514.

39)

Levitus, S., J. Antonov, X. Zhou, H. Dooley, K. Selemenov, V. Tereschenkov, 1996: Decadal-scale variability of the North Atlantic Ocean. Eds. D. G. Martinson, K. Bryan, M. Ghil, M.M. Hall, T.M. Karl, E. S. Sarachik, S. Sorooshian, and L. D. Talley. *Natural Climate Variability on Decade-to-Century Time Scales*. National Academy of Sciences Press, 318-324.

40)

Zhang, R.-H. and S. Levitus 1996: Structure and evolution of interannual variability of the tropical Pacific upper ocean temperature. *J. Geophys. Res.-Oceans.*, 101, 20501-20524.

41)

Belkin, I. M. and S. Levitus, 1996: Temporal Variability of the subarctic front near the Charlie-Gibbs Fracture Zone. *J. Geophys. Res.-Oceans*, 101(C12), 28, 317-28,324.

42)

Zhang, R-H., and S. Levitus, 1997: Structure and cycle of decadal variability of upper-ocean temperature in the North Pacific. *J. Climate*, 10, 710-727.

43)

Young, C., A. Da Silva, A., and S. Levitus, 1997: Atlas of Surface Marine Data 1994, Vol. 6: Heat Flux Sensitivity to Sea Surface Temperature. NOAA Atlas NESDIS 12. U.S. Gov. Printing Office, Wash., D.C., pp. 103.

44)

Young, C., A. Da Silva, A., and S. Levitus, 1997: Atlas of Surface Marine Data 1994, Suppl. A: NOAA Atlas NESDIS 13. U.S. Gov. Printing Office, Wash., D.C., 103 pp.

45)

Boyer, T.P., and S. Levitus, 1997: Objective analyses of temperature and salinity for the world ocean on a 1/4° grid. NOAA Atlas NESDIS 11. U.S. Gov. Printing Office, Wash., D.C., 83 pp.

46)

Zhang, R-H., and S. Levitus, 1997: Interannual variability of the coupled tropical Pacific ocean-atmosphere system associated with the El Nino-Southern Oscillation, J. Climate, 10, 1312-1330.

47)

G. I. Monterey and S. Levitus, 1997: Climatological atlas of mixed layer depth of the world ocean depth. NOAA Atlas NESDIS 14,. U.S. Gov. Printing Office, Wash., D.C., 5 pp. and 87 figures.

48)

Levitus, S. and G.I. Monterey, 1997: Seasonal variability of dynamic height and its fourier analysis. NOAA Atlas NESDIS 15. U.S. Gov. Printing Office, Wash., D.C., 5 pp., 37 figs.

49)

Levitus, S. and J. Antonov, 1997: Climatological and Interannual Variability of Temperature, Heat Storage, and Rate of Heat Storage in the Upper Ocean, NOAA NESDIS Atlas 16. U.S. Gov. Printing Office, Wash., D.C., 6 pp., 186 figs.

50)

da Silva, A., C. Young, and S. Levitus, 1997: Atlas of Surface Marine Data 1994, Suppl. B: Procedures for 1/2° x 1/2° data set. NOAA Atlas NESDIS 17. U.S. Gov. Printing Office, Wash., D.C., 128 pp.

51)

Belkin, I. M., S. Levitus, and J. I. Antonov, 1998: "Great Salinity Anomalies" in the North Atlantic, Prog. Oceanogr., 41, 1-68.

52)

Levitus, S., M. E. Conkright, T.P. Boyer, T. O'Brien, J. Antonov C. Stephens, L. Stathoplos, D. Johnson, R. Gelfeld, 1998: World Ocean Database 1998a, Volume 1: Introduction. NOAA Atlas NESDIS 18, U.S. Gov. Printing Office, Wash., D.C., 346 pp.

53)

Levitus, S., T.P. Boyer, M.E. Conkright, D. Johnson, T. O'Brien, J. Antonov, C. Stephens, R. Gelfeld, 1998b: World Ocean Database 1998, Volume 2: Temporal Distribution of Mechanical Bathythermograph Profiles. NOAA Atlas NESDIS 19, U.S. Gov. Printing Office, Wash., D.C., 286 pp.

54)

Boyer, T.P. , J. Antonov, J., S. Levitus, M.E. Conkright, T. O'Brien, C. Stephens, D. Johnson, R. Gelfeld, 1998: World Ocean Database 1998, Volume 3: Temporal Distribution of Expendable Bathythermograph Profiles. NOAA Atlas NESDIS 20, U.S. Gov. Printing Office, Wash., D.C., 170 pp.

55)

Boyer, T. P., M. E. Conkright, S. Levitus, C. Stephens, T. O'Brien, D. Johnson, R. Temporal Distribution of Conductivity-Temperature-Depth Profiles. NOAA Atlas NESDIS 21, U.S. Gov. Printing Office, Wash., D.C., 163 pp.

56)

Boyer, T.P., M.E. Conkright, S. Levitus, D. Johnson, J. Antonov, T. O'Brien, C. Stephens, R. Gelfeld, 1998b: World Ocean Database 1998, Volume 5: Temporal Distribution of Ocean Station Data (Bottle) Temperature- Salinity Profiles. NOAA Atlas NESDIS 22, U.S. Gov. Printing Office, Wash., D.C., 108 pp.

57)

Conkright M.E., S. Levitus, T. O'Brien, T.P. Boyer, C. Stephens, D. Johnson, L. Stathoplos, 1998a: World Ocean Database 1998, Volume 6: Temporal Distribution of Ocean Station Data (Bottle) Nutrient profiles. NOAA Atlas NESDIS 23, U.S. Gov. Printing Office, Wash., D.C., 296 pp.

58)

O'Brien, T., M.E. Conkright, S. Levitus, T.P. Boyer, C., D. Johnson, L. Stathoplos, O. Baranova, 1998: World Ocean Database 1998, Volume 7: Temporal Distribution of Station Data (Bottle) Oxygen Profiles. NOAA Atlas NESDIS 24, U.S. Gov. Printing Office, Wash., D.C., 235 pp.

59)

Conkright M.E., L. Stathoplos, T. O'Brien, T.P. Boyer, C. Stephens, D. Johnson, S. Levitus, 1998b: World Ocean Database 1998, Volume 8: Temporal Distribution of Ocean Station Data (Bottle) Chlorophyll Profiles and Plankton Data. NOAA Atlas NESDIS 25, U.S. Government Printing Office, Wash., D.C.,

60)

Matishov, G., A. Zuev, V. Golubev, N. Adrov, V. Slobodin, S. Levitus, I. Smolyar, 1998: Climatic Atlas of the Barents Sea 1998: Temperature, Salinity, Oxygen. World Data Center-A for Oceanography, International Ocean Atlas Series, Vol. 1. NOAA Atlas NESDIS 26 ,U.S. Government Printing Office, 25 pp., 95 Figs.

61)

J. Antonov, S. Levitus, T.P. Boyer, M. Conkright, T. O'Brien, 1998: World Ocean Atlas 1998 Vol. 1: Atlantic Ocean temperature fields. NOAA Atlas NESDIS 27, U.S. Gov. Printing Office, Wash., D.C., 166 pp.

62)

Antonov, J., S. Levitus, S., T.P. Boyer, M. Conkright, T. O'Brien, 1998: World Ocean Atlas 1998 Vol. 2: Pacific Ocean temperature fields. NOAA Atlas NESDIS 28, U.S. Gov. Printing Office, Wash., D.C.,166 pp.

63)

Antonov, J., S. Levitus, T.P. Boyer, M. Conkright, T. O'Brien, B. Trotsenko, 1998: World Ocean Atlas 1998 Vol. 3: Indian Ocean temperature fields. NOAA Atlas NESDIS 29, U.S. Gov. Printing Office, Wash., D.C., 166 pp.

64)

Boyer, T. P., S. Levitus, M. Conkright, T. O'Brien, 1998: World Ocean Atlas 1998 Vol. 4: Atlantic Ocean salinity fields. NOAA Atlas NESDIS 30, U.S. Gov. Printing Office, Wash., D.C., 166 pp.

65)

Boyer, T.P., S. Levitus, M. Conkright, T. O'Brien 1998: World Ocean Atlas 1998 Vol. 5: Pacific Ocean salinity fields. NOAA Atlas NESDIS 31, U.S. Gov. Printing Office, Wash., D.C., 166 pp.

66)

T.P. Boyer, S. Levitus, M. Conkright, T. O'Brien, B. Trotsenko, 1998: World Ocean Atlas 1998 Vol. 6: Indian Ocean salinity fields. NOAA Atlas NESDIS 32, U.S. Gov. Printing Office, Wash., D.C., 166 pp.

67)

O'Brien, T., T.P. Boyer, M. Conkright, S. Levitus 1998: World Ocean Atlas 1998 Vol. 7: Atlantic Ocean dissolved oxygen, oxygen saturation, and Apparent Oxygen Utilization fields. NOAA Atlas NESDIS 33, U.S. Gov. Printing Office, Wash., D.C., 234 pp.

68)

O'Brien, T., T.P. Boyer, M. Conkright, S. Levitus 1998: World Ocean Atlas 1998 Vol. 8: Pacific dissolved oxygen, oxygen saturation, and Apparent Oxygen Utilization fields. NOAA Atlas NESDIS 34, U.S. Gov. Printing Office, Wash., D.C., 234 pp.

69)

O'Brien, T., T.P. Boyer, M. Conkright, S. Levitus 1998: World Ocean Atlas 1998 Vol. 9: Indian Ocean dissolved oxygen, oxygen saturation, and Apparent Oxygen Utilization fields. NOAA Atlas NESDIS 35, U.S. Gov. Printing Office, Wash., D.C., 234 pp.

70)

M. Conkright, S. Levitus, T. P. Boyer, T. O'Brien, 1998: World Ocean Atlas 1998 Vol. 10: Nutrients and chlorophyll of the Atlantic Ocean. NOAA Atlas NESDIS 36, U.S. Gov. Printing Office, Wash., D.C., 217 pp.

71)

M. Conkright, S. Levitus, T. P. Boyer, T. O'Brien, 1998: World Ocean Atlas 1998 Vol. 11: Nutrients and chlorophyll of the Pacific Ocean. NOAA Atlas NESDIS 37, U.S. Gov. Printing Office, Wash., D.C., 217 pp.

(2)

M. Conkright, S. Levitus, T. P. Boyer, T. O'Brien, 1998: World Ocean Atlas 1998 Vol. 12: Nutrients and chlorophyll of the Indian Ocean. NOAA Atlas NESDIS 38, U.S. Gov. Printing Office, Wash., D.C., 217 pp.

73)

Boyer, T. P., M. Conkright, and S. Levitus, 1999: Seasonal variability of dissolved oxygen and percent oxygen saturation in the Atlantic and Pacific Oceans. Deep-Sea Res., 46, 1593-1614.

74)

Matishov, G. G., V. V. Denisov, A. N. Zuyev, V. A. Golubev, N. M. Adrov, S. Levitus, I. V. Smolyar, 1999: Climatic Atlas of the Barents Sea. Doklady Earth Sciences (English translation of Doklady Akademii Nauk, Russia), 366 (5), 692-694.

75)

Conkright, M.E. and S. Levitus, 2000: Seasonal cycle of phosphate in the world ocean. Deep-Sea Res., 47, 159-175.

76)

Levitus, S., J. Antonov, T.P. Boyer, C. Stephens, 2000: Warming of the World Ocean. Science, 287, 2225-2229.

77)

Belkin, I. M., S. Levitus, J. I. Antonov, and S.-A. Malmberg, 2000: Corrigendum to "Great Salinity Anomalies" in the North Atlantic. Progress in Oceanography, 41 (1998) 1-68, Progress in Oceanography, 45(1), 107-108.

78)

Matishov, G., P. Makarevich, S. Timofeev, L. Kuznetsov, N. Druzhkov, V. Larionov, V. Golubev, A. Zuev, N. Adrov, V. Denisov, G. Iliyn, A. Kuznetsov, S. Denisenko, V. Savinov, A. Shavikyn, I. Smolyar, S. Levitus, T. O'Brien, O. Baranova, 2000: Biological Atlas of the Arctic Seas 2000: Plankton of the Barents and Kara Seas. World Data Center-A for Oceanography, International Ocean Atlas Series, Vol. 2. NOAA Atlas NESDIS 39, U.S. Gov. Printing Office, Wash., D.C., 348 pp.

79)

Levitus, S., C. Stephens, J. Antonov, and T. P. Boyer, 2000: Yearly and Year-Season Upper Ocean Upper Ocean Temperature Fields, 1948-98. NOAA Atlas NESDIS 40, U.S. Gov. Printing Office, Wash., D.C., 24 pp.

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Levitus, S., Antonov, J. Wang, T. L. Delworth, K. W. Dixon, A. J. Broccoli, 2001: Anthropogenic warming of earth's climate system. Science, 292, 267-270.

81)

Sapozhnikov, A. Gruzevich, V. Zubarevich, N. Arxhanova, N. Mordasova, I. Nalyotova, N. Torgunova, Y. Mikhailovsky, I. Smolyar, 2001: Hydrochemical Atlas of the Sea of Okhotsk. World Data Center-A for Oceanography, International Ocean Atlas Series, Vol. 3. NOAA Atlas NESDIS 41, U.S. Gov. Printing Office, Wash., D.C., 155 pp.

82)

Stephens, C., S. Levitus, J. Antonov, T. Boyer, 2001: The Pacific regime shift, Geophys. Res. Lett., 28, 3721-3724.

83)

Boehlert, G. W., D. P. Costa, D. E. Crocker, P. Green, T. O'Brien, S. Levitus, and B. J. Le Boeuf, 2001: Autonomous Pinniped Environmental Samplers; Using instrumented animals as oceanographic data collectors. J. Atmo. and Oceanic Tech., 18, 1882-1893.

84)

Levitus, S. and A. Sarkisyan, 2001: Ocean dynamic characteristics obtained by synthesizing climatic data and the WOCE program information. Izvestiya Atm. Oceanic Physics, 37, 496-507.

85)

Antonov, J. I., S. Levitus, T. P. Boyer, 2002: Steric sea level variations during 1957-1994: Importance of salinity. *J. Geophys. Res.- Oceans*, 8013, doi:10.1029/2001JC000964.

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Boyer, T. P. and S. Levitus, 2002: Harmonic analysis of climatological sea surface salinity. *J. Geophys. Res.- Oceans*, 8006, doi:10.1029/2001JC0000829.

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Levitus, S. and Y. Sychev, 2002: Atlas of temperature-salinity frequency distributions: North Atlantic. *International Ocean Atlas and Information Series, Vol. 4. NOAA Atlas NESDIS 55, U.S. Gov. Printing Office, Wash., D.C., CD-ROMs, 22 pp.*

88)

Hansen, J., M. Sato, L. Nazarenko, R. Ruedy, A. Lacis, D. Koch, I. Tegen, T. Hall, D. Shindell, B. Santer, P. Stone, T. Novakov, L. Thomason, R. Wang, Y. Wang, D. Jacob, S. Hollandsworth, L. Bishop, J. Logan, A. Thompson, R. Stolarksi, J. Lean, R. Wilson, S. Levitus, J. Antonov, N. Rayner, D. Parker, J. Christy, 2002: Climate forcings in Goddard Institute for Space Studies SI2000 simulations. *J. Geophys. Res.-Atmosph.*, 107, art. no. 4347.

89)

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ENCYCLOPEDIA ARTICLES:

LIST OF SOME OF THE AND PRESENTATIONS AND TALKS GIVEN BY SYDNEY LEVITUS

Date	Meeting Name and Location	Title of Talk
11/12	U. MD- Atm. & Ocean Sci. Dept.	Research and data Management at the NODC Ocean Climate Laboratory and World Data Center for Oceanography
4/11	EGU Vienna, Austria	Multidecadal Variability of the North Atlantic Ocean
3/11	IODE 50 th Anniversary, Liege, Belgium	Scientific Work made possible by the GODAR and WOD projects
12/10	AGU San Francisco	Thermosteric component of global sea level change, 1955-2009
12/10	Argo Seattle	
4/10	SeaDataNet, Paris France	World Ocean Database & interaction with SeaDataNet
2/10	Ocean Sciences, Portland	Warming of the World Ocean
12/09	AGU, San Francisco	Building Global Ocean Databases
12/09	Yale U., New Haven	Warming of the World Ocean and Earth's heat balance
4/09	EGU Annual Meeting, Vienna	Warming of the World Ocean, 1955-2008
9/4/08	NOAA/OGP/OCO Annual Meeting	Ocean Heat Content
12/07	AGU Annual Meeting	Warming of the World Ocean, 1955-2006
9/10/07	CCPO/Old Dominion University	Warming of the World Ocean, 1955-2006
4/07	EGU Annual Meeting, Vienna	Warming of the World Ocean, 1955-2005
12/06/06	Third International GODAR Workshop, JODC, Tokyo, Japan	1) Results of the GODAR project 2) Warming of the World Ocean
9/06	Seminar at the Southern Scientific Center of the Russian Academy of Sciences at Rostov-on-Don, Russia	Warming of the World Ocean, 1955-2005
9/06	Seminar at the Southern Scientific Center of the Russian Academy of Sciences at Rostov-on-Don, Russia	Building ocean profile-plankton databases for scientific Research
9/06	Seminar at Institute for Numerical Mathematics, Moscow	"Warming of the World Ocean and World Ocean Database 2005"
6/06	IOC Sea Level Meeting, Paris, France	Poster- Thermosteric component of sea level change
5/06	U. Bergen, Norway	Warming of the World Ocean
4/05	EGU Annual Meeting, Vienna, Austria	Warming of the World Ocean, 1955-2005
12/05	AGU Annual Meeting, San Francisco	Building Ocean Profile Databases for Climate System Research: Warming of the World Ocean- INVITED TALK
12/05	AGU Annual Meeting, San Francisco	Ocean Steric Sea Level, 1955-2003- INVITED TALK
9/05	University of Delaware- Newark, Delaware	Warming of the World Ocean, 1955-2003 and Earth's Heat Balance

9/05	NOAA/R.A.S. Meeting of the: "Joint Coordinating Committee on Cooperation in the Field of World Oceans and Polar Regions Studies	Cooperation in Area of Data and Information Exchange- U.S.A. Perspective
9/05	JCOMM Science Meeting Halifax, Canada	What does the ocean tell us about climate change?
6/05	NCEP/NOAA	Warming of the World Ocean, 1955-2003
5/05	University of Maryland, ESSIC	Warming of the World Ocean, 1955-2003
5/05	IFREMER, Brest, France	Warming of the World Ocean, 1955-2003
5/05	International Marine Data and Information System Meeting (IMDIS) Brest, France	"World Ocean Database 2001": An Ocean Profile-Plankton Database for Ocean and Climate-System Research
4/05	XVIII Session of the IOC Committee on International Oceanographic Data and Information Exchange (IODE), Oostende, Belgium	Global Oceanographic Data Archaeology and Rescue Project (GODAR)
4/05	XVIII Session of the IOC Committee on International Oceanographic Data and Information Exchange (IODE), Oostende, Belgium	WDC for Oceanography, Silver Spring Intersessional report
4/05	NASA Sea Level Workshop, Landover, MD	Ocean Thermosteric Sea Level, 1955-2003
3/05	University of Bergen	Salinity Variability, 1955-1998
3/05	University of Bergen	Building Ocean Profile-Plankton Databases for Climate System Research
3/05	University of Bergen	Warming of the World Ocean and Earth's Heat Balance, 1955-2003
1/05	American Meteorological Society Annual Meeting-Suki Manabe Symposium	Variability of Heat Content and Salinity for the World Ocean, 1955-2003
12/04	European Geophysical Union Annual Meeting	Variability of Heat Content and Salinity for the World Ocean, 1955-2003
11/04	GODAR WESTPAC Meeting	Status of the IOC Global Oceanographic data Archaeology and Rescue Project
04/28/04	NFRDI International Symposium on Climate Change, Busan, Korea	Objective Analysis of Temperature and Salinity for The World Ocean on a 1/4 Grid
04/28/04	NFRDI International Symposium on Climate Change, Busan, Korea	World Ocean Heat Content, 1955-2000
04/28/04	NFRDI International Symposium on Climate Change, Busan, Korea	Steric and freshwater contributions to sea level changes in 1957-1998
04/14/04	NOAA OGP Office of Climate Observation Annual System Review	Ocean Heat Content and the Upper Ocean Observing System- a Critical Look from a User Perspective
04/04	European Geophysical Union Annual Meeting	The IOC Global Oceanographic Data Archaeology and Rescue

		(GODAR) Project (INVITED TALK)
04/04	European Geophysical Union Annual Meeting	Steric and freshwater contributions to sea level changes in 1957-1998
04/04	European Geophysical Union Annual Meeting	World Ocean Heat Content, 1955-2000
12/03	American Geophysical Union, Annual Meeting	World Ocean Heat Content, 1955-2000
07/02/03	IUGG, Sapporo, Japan	Warming of the World Ocean (INVITED TALK)
03/28/03	S.U.N.Y.- Stony Brook	Research and data Management Activities at the National Oceanographic data Center: Warming of the World Ocean and Earth's Heat Balance
03/03	IODE XVII	Status of the GODAR Project Status of WDC for Oceanography-Silver Spring
01/03	Stellar Sea Lion	World Ocean Database 2001: An Ocean Profile-Plankton Database for the study of Environmental Change
01/03	NFRDI, Busan, Rep. of Korea	Research and ocean data management at NODC
05/09/02	Liege Colloquium- "Tracer Methods in Geophysical Fluid Dynamics"	Building Global Ocean Profile-Plankton Databases for Scientific Research
01/24/02	U.S. Arctic Research Commission	NOAA National Data Centers: Data Rescue in the Former Soviet Union

12/07/02	Japan Frontier Research Center for Global Change Research	Warming of the World Ocean
12/04/02	GODAR/WESTPAC Meeting- Japan Oceanographic Data Center	The GODAR and WOD Projects: Past, Present, and Future
11/20/01	Scripps Institute of Oceanography-Physical Oceanography Research Division	Warming of the World Ocean
11/19/01	Scripps Institute of Oceanography- Student Distinguished Lecture Series	1) International Data Exchange 2) Interannual-to-decadal variability of the world ocean
11/16/01	Jet Propulsion Laboratory	Warming of the World Ocean
10/23/01	IOC ODINCARSA (Ocean data and Information Network for the IOCARIBE and South American regions)	Building Ocean Profile-Plankton Databases for Climate Research
10/06/01	PICES Annual Meeting	Building Ocean Databases for Climate Research
08/08/01	NRC Workshop on Climate Change Feedbacks,	Observational data for climate change studies

	Boulder, CO	
06/08/01	National Academy of Science "Senate Climate Change Forum"	Warming of the World Ocean
03/28/01	European Geophys. Soc. Annual Meeting, Nice, France	Steric Sea Level variability During 1955-95
12/15/00	American Geophys. Union Annual Meeting San Francisco	1) Warming of the World Ocean 2) Warming of Earth's Climate System
11/28/00	N.Y. Academy of Sciences Annual Meeting	Warming of the World Ocean
10/30/00	International Oceanographic Data and Information Exchange Quadrennial Meeting (IODE XVI), Lisbon, Portugal	1) Report on intersessional activities of the WDC for Oceanography 2) Report on the results and status of the GODAR Project
10/18/00	Ocean Observations for Climate Meeting St. Raphael, France	Interannual-to-Decadal Variability of the Temperature-Salinity Structure of the World Ocean: How Deep and Where do We Need to Measure?
09/24/00	NASA Salinity and Sea Ice Working Group	Sea surface salinity variability on interannual-to-decadal scales
2013	UMD	Research activities at the NODC/OCL
2013	D.C?- Sea level	Ocean warming

09/07/00	James Baker III Institute for Public Policy- Rice University Houston Texas	Warming of the World Ocean
02/2000	Japan Marine Science and Technology Center	1) Results and Status of the IOC "Global Oceanographic Data Archaeology and Rescue Project" 2) A proposed "World Ocean Database Project"
01/12/99	Amer. Meteor. Soc.- Global Change Symposium	Temporal Variability of the Temperature-Salinity Structure of the World Ocean
07/12/99	International GODAR Review Meeting	1) Results of the GODAR Project 2) Scientific Results Made Possible by the GODAR Project
07/99	International Union of Geodesy and Geophysics	Interannual-to-Decadal Variability of the Temperature- Salinity Structure of the World Ocean
12/12/98	AGU Meeting	1) Building the "World Ocean database 1998": What have we learned. [in Session U10: Observations and Data We Should be Preserving for Our Grandchildren] 2) Variability of sea level pressure and ocean heat content of the North Atlantic Ocean. [in session OS51B: Ocean and Climate Signatures of the North Atlantic Oscillation]
11/4/98	Data Archiving: Policies and Practice - A workshop sponsored by the Global Change Data Management Working Group of the USGCRP	Building Global Ocean data Bases for Global Change Research
10/26/98	International Conference "Expeditionary Research of the World Ocean and Oceanographic Information Resources - OIR "98" World Data Center-B for Oceanography, Obninsk, Russia	The GODAR Project
09/19/98	NOAA Pacific Fisheries Environmental Laboratory, Monterey	Interannual-to-decadal variability of the temperature- salinity structure of the ocean: Databases and observations

05/30/98	WOCE Conference on Ocean Circulation and Climate- Halifax, Canada	The WOCE Period in a Long-Term Context: WOCE Versus Climatology
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10/15/97	Ocean Data Symposium, Dublin, Ireland	World Ocean Database 1998: New Opportunities for Ocean Research
8/95	IAPSO Meeting, Hawaii	Interannual to Decadal Scale Variability of the World Ocean
9/20/89	NASA Climate Data Systems Workshop, GSFC (Invited Talk)	Global analysis of oceanographic data: Past present, and future
7/12/89	Stanstead Seminar at McGill University (Invited talk)	Temporal variability of the thermohaline structure of the North Atlantic Ocean, 1970-74 versus 1955-59
5/31/89	Lamont Doherty	Temporal Variability of the Thermohaline Structure of the North Atlantic Ocean, 1970-74 versus 1955-59
5/9/89	DOE Conf. On "Greenhouse-Gas-Induced Climate Change- U. Mass., Amherst MA	Temporal Variability of the Thermohaline Structure of the North Atlantic Ocean
8/8/88	Scripps Institute of Oceanography	Interpentadal variability of temperature and salinity at intermediate depths of the North Atlantic Ocean, 1970-74 versus 1955-59
8/4/88	JPL, Pasadena, CA	Interpentadal variability of temperature and salinity at intermediate depths of the North Atlantic Ocean, 1970-74 versus 1955-59
6/16/88	Dept. Meteorology, U. Maryland	Interpentadal variability of temperature and salinity at intermediate depths of the North Atlantic Ocean, 1970-74 versus 1955-59
6/16/88	OAR/NOAA, Rockville	Interpentadal variability of temperature and salinity at intermediate depths of the North Atlantic Ocean, 1970-74 versus 1955-59
2/16/86	WOCE Oceanographic Data Subgroup Meeting	Climatological Averages of Historical Data
1/24/86	NCAR	Fourier Analyses of Sea Surface Temperature Climatologies
1/21/86	COADS Workshop, Boulder, CO	Interannual variability of Surface Marine Fields
12/17/85	GFDL, Princeton	A Comparison of the Annual Cycle of Two Sea Surface Temperature Climatologies
10/24/84	NATO Advanced Research Workshop, Venice, Italy	Annual Cycle of salinity in the World Ocean
9/25/84	SCOR WG-68 at GFDL, Princeton, NJ	Activities in the analysis of historical oceanographic data
6/12/84	GFDL, Princeton	Annual cycle of temperature and heat storage in the world ocean

4/5/84	Vertical Datum Meeting of the Vertical Datum Dub-Committee on Geodesy, National Academy of Sciences	Global Estimates of Sea Surface Topography
3/14/84	NODC, Wash., D.C.	Quality Control of Physical Oceanographic data
1/5/84	Scripps Institute Of Oceanography, La Jolla, CA	Annual Cycle of temperature in the World Ocean
4/20/82	WHOI	Distribution of Geostrophic Shear in the World Ocean
12/3/80	GFDL, Princeton, NJ	Geostrophic Shear and Circulation in the World Ocean
11/6/80	Scripps Institute of Oceanography	Global Ocean circulation
2/3/78	NODC, Wash., D.C.	Global Analysis of Oceanographic data
10/21/77	Scripps Institute Of Oceanography, La Jolla, CA	Global Analysis of Oceanographic data
10/19/77	NOAA Climate Diagnostics Workshop, SIO, La Jolla	Global Analysis of Oceanographic data- {Present status of climate data in oceanography- the heat storage problem
10/12/77	Lawrence Livermore Lab.	Global Analysis of Oceanographic data
12/76	GFDL, Princeton, NJ	Global Analysis of Oceanographic data
7/26/76	Colorado State University, Fort Collins, CO	Global Analysis of Oceanographic data and heat storage in the world ocean