

**VITA - WARREN M. WASHINGTON**

**DATE & PLACE OF BIRTH:** 28 August 1936, Portland, Oregon

**EDUCATION:** B.S. 1958 Oregon State University (Physics)  
M.S. 1960 Oregon State University (Meteorology)  
Ph.D. 1964 Pennsylvania State University (Meteorology)

**RESEARCH POSITIONS:**

2015-present	Distinguished Scholar National Center for Atmospheric Research, Boulder, Colorado
May 1995-2015	Senior Scientist; Climate Change Research Section, Climate & Global Dynamics Division, National Center for Atmospheric Research, Boulder, Colorado
June 1987-May 1995	Director, Climate & Global Dynamics Division; Senior Scientist; Leader, Climate Sensitivity and CO <sub>2</sub> Research Group, National Center for Atmospheric Research, Boulder, Colorado.
October 1974-June 1987	Senior Scientist; Head, Climate Section; Leader, Global Climate Modeling Group; Member, Community Climate Model Steering Committee, National Center for Atmospheric Research, Boulder, Colorado.
July 1973-October 1974	Project Leader, Large-Scale Modeling and Analysis Group, National Center for Atmospheric Research, Boulder, Colorado.
June 1972-July 1973	Program Scientist, Dynamical Aspects of Atmospheric Circulation, National Center for Atmospheric Research, Boulder, Colorado.
1963-present	Senior Scientist, National Center for Atmospheric Research, Boulder, Colorado. Numerical weather prediction and computer simulation of the Earth's climate
1968-1971	Adjunct Associate Professor of Meteorology and Oceanography, College of Engineering, University of Michigan, Ann Arbor, Michigan.
1960-1963	Research Associate, Pennsylvania State University, University Park, Pennsylvania. Objective analysis and numerical weather prediction.
1959 (Summer)	Mathematician, Stanford Research Institute, Menlo Park, California. Objective analysis of meteorological fields.

## **PROFESSIONAL SOCIETIES:**

### American Meteorological Society:

Member, Ad Hoc Committee on Increasing Number of Black Scientists in AMS  
Member, Board on Women and Minorities (1976)  
Chairman, Committee on Nominations (1982)  
Member, Committee on the History of the Atmospheric Sciences (1985-1987  
and 1988-1989)  
Member, Council (1986-1988)  
Member, Board on Women and Minorities (1988-1990)  
Member, Awards Committee (1991-1994)  
Chair, Ad Hoc Committee on development of a career booklet entitled "The  
Challenge of Meteorology" (1991-1992)  
President-Elect (1993)  
President (1994)  
Past President (1995, 1996)  
History of the Atmospheric Sciences Committee (1999-2005)  
AMS Award Committee (2000)

### American Association for the Advancement of Science:

Chairman, Youth Council (1971)  
Committee on Meetings (1970-1971)  
Member, Committee on Minorities in Science (1971-1972)  
Member, Committee on Opportunities in Science (1973-1978)  
Chairperson, Committee on Opportunities in Science (1975-1978)  
Chairperson, Panel on Black Scientists (1973-1978)  
Member, Committee on Nominations (1980-1982)  
Member, Electorate Nominating Committee (1981-1984)  
Chairperson, Electorate Nominating Committee, Section W (Atmospheric and  
Hydrospheric Sciences) (1984-1985)  
Member, Committee on Climate (1985-1988)  
Chair-Elect, Section on Atmospheric and Hydrospheric Sciences (1990-1991)  
Board of Directors (1991-1995)  
Board Representative to the Committee on Science, Engineering and  
Public Policy (1991)  
Board Representative to the Committee on Opportunities in Science (1992-1995)  
Member of the National Taskforce for the NSF-Funded Museum Equity Project  
(Project MOSAIC) (1992-1994)  
Member, the National Committee, American Association for the Advancement of  
Science Center for Science and Engineering (1994-2006)

National Academy of Engineering (2002)

American Philosophical Society (2003),  
Vice President (2018-2023)

Academy of Arts and Sciences (2009)

National Associate of the National Academy of Sciences (2011) Lifetime Appointment

American Geophysical Union - AGU Fellow (2013)

## **AWARDS AND HONORS:**

Presidential Appointment to the National Advisory Committee on Oceans and Atmosphere (1978-1984)

Fellow, American Meteorological Society (1980)

Fellow, American Association for the Advancement of Science (1981)

Fellow, The Alumni Fellow Program, The Pennsylvania State University (1989)

One of 16 scientists featured in the Chicago Museum of Science and Industry's "Black Achievers in Science" Exhibit. The exhibit is touring major science centers and museums in the United States from 1988-1995

Fellow, The Alumni Fellow Program, Oregon State University (1990)

Distinguished Alumni Award, Pennsylvania State University (1991)

Fellow, African Scientific Institute (1993)

Presidential Appointment to National Science Board (1994-2006)

Le Verrier Medal of the Societe Meteorologique de France (1995)

E. B. Lemon Distinguished Alumni Award, Oregon State University (1996)

Inducted into the National Academy of Sciences Portrait Collection Of African Americans in Science, Engineering, and Medicine (1997)

Department of Energy Biological and Environmental Research Program  
Exceptional Service Award for Atmospheric Sciences (1997)

Sigma Xi Distinguished Lecturer (1998-1999)

University Corporation for Atmospheric Research Walter Orr Roberts Distinguished Lecturer (1998)

Dr. Charles Anderson Award, American Meteorological Society, (2000)

National Weather Service Modernization Award (1999)

Celebrating 20th Century Pioneers in Atmospheric Sciences Award (2000)

Colorado's Bonfils-Stanton Foundation Science Award (2000)

Franklin Institute Black History Month Exhibit on African Americans in Science (2002)

Elected to the National Academy of Engineering (2002)

Elected to American Philosophical Society, (2003)

Recipient of Reed College Vollum Award for Distinguished Accomplishment in Science and Technology (2004)

Elected Honorary Member of the American Meteorological Society – Highest award given by the AMS (2006)

Commencement Speaker and recipient of Honorary Doctorate of Science, Oregon State University (2006)

Science Spectrum Trailblazer, Science Spectrum Magazine (2006)

Robert D. Cess Distinguished Topics in Atmospheric and Oceanic Sciences Seminar Speaker, State University of New York at Stony Brook, (2006)

Charles Franklin Brooks Award for Outstanding Services to the Society, American Meteorological Society (January 2007)

Experience Works, Primetime Award for Outstanding Older Worker for Colorado (2007)

U. S. Department of Energy Lifetime Achievement Award from Raymond L. Orbach (2007)

Warren Washington Symposium on Climate Modeling, Prediction and Science Policy, NCAR (2007)

Commencement Speaker and recipient of Honorary Doctorate at Bates College, Lewiston, Maine (2008)

Jule G. Charney Award for Outstanding Collaborative Contributions to Modeling Climate and its Response to Anthropogenic and Natural Forcings, received with Dr. Gerald A. Meehl, American Meteorological Society (2009)

Elected Fellow of the American Academy of Arts & Sciences (2009)

Warren Washington Special Symposium at the American Meteorological Society 2010 Annual Meeting (2010)

2010 Tzvi Gal-Chen Memorial Lecturer, University of Oklahoma (2010)

2010 Recipient of the Charles L. Hosler Alumni Scholar Medal, College of Earth and Mineral Sciences, The Pennsylvania State University (2010)

Texas State Senate Proclamation 94 for significant contributions to the study of climate change (2010)

Recipient of 2010 James E. Stewart Award, American Association of Blacks in Energy (2010)

Recipient of the 2009 National Medal of Science awarded by President Barack Obama on November 17, 2010 (Citation: *for his fundamental contributions to the understanding of Earth's coupled climate system through numerical simulation, leadership in U.S. science policy, and inspiring mentorship of young people of all backgrounds and origins.*)

In 2012, *A Night with Warren Washington* was presented at the National Academy of Sciences by the Historymakers. This was a PBS interview of Washington by Ralph Cicerone, The President of the Academy.

Urban Education Institute Award, North Carolina A&T State University (2013)  
(Citation: *In Recognition of your numerous and inspirational contributions to raising the achievement and performance levels of People of Color in the STEM fields*)

Selected Speaker for The Bert Bolin Lecture on Climate Research, University of Stockholm, Sweden (2013)

National Organization of Black Chemists and Chemical Engineers (NOBCCChE) Percy L. Julian Award (2013)

Honorary Doctorate, University of Massachusetts, Amherst, October 18, 2013, Doctor of Science, (*Honoris causa*)

Supercomputing13, November 2013, Keynote Speaker

American Geophysical Union, Fellow, December 2013

Martin Luther King, Jr. Keynote speech at Northwestern University, January 20, 2014

Association of American Geographers' Honorary Geographer Award, April 2014

Distinguished Alumni Achievement Award, Oregon State University, November 2014

Alpha Phi Alpha, Public Award of Merit, 2015

NCAR Distinguished Scholar Award (2015-2023)

Honorary Doctorate, Colby College, Maine, May 2017

Warren Washington Legacy Symposium: A Scientific Journey in Climate Modeling, Research, and Science at Pennsylvania State University where University President, Eric Barron, announced that they would name a building at Innovation Park in his honor, September, 2018

Building naming ceremony at Pennsylvania State University Innovation Park, May 2019.

Awarded the International Tyler Prize for Environmental Research with Michael Mann,  
May 2019

Awarded the Oregon State University, College of Science 2019 Lifetime Achievement in  
Science Award. September 2019.

The American Meteorological Society (AMS) announced a new national award in honor  
of Dr. Washington. *The Warren Washington Research and Leadership Medal will be  
presented to individuals who are recognized for the combination of highly significant  
research and distinguished scientific leadership in the atmospheric and related sciences.*  
February, 2020

## COMMITTEES AND PANELS:

Member, Advisory Panel for Atmospheric Sciences of the National Science Foundation (1972-1974)

Member, Panel on Climatic Variation of National Academy of Sciences/National Research Council (1972-1975)

Member, Panel on the Monsoon Experiment of National Academy of Sciences--U.S. GARP Committee (1974)

Member, Panel on Energy and Climate of Geophysics Research Board of National Academy of Sciences/National Research Council (1974-1976)

Member, Panel on National Science Foundation Energy-Related Postdoctoral Fellowship Program (1975-1977)

Member, Governor's Science and Technology Advisory Council, State of Colorado (1975-1978)

Member, President's National Advisory Committee on Oceans and Atmosphere (1978-1984): Panels dealing with ocean waste management, hydrology, satellites, government reorganization, atmospheric research facilities, ocean weather services, and weather modification. Chair of the Weather Services Panel that issued the 1982 report on "The Future of the Nation's Weather Services."

Member, U.S. National Committee for the International Union of Geodesy and Geophysics (1978-1982)

Chair, Subcommittee for International Association of Meteorology and Atmospheric Physics (IAMAP) (1979-1982)

Member, Evaluation Panels, Research Associateship Program, National Research Council (1983, 1987)

External Examiner, Department of Meteorology, University of Nairobi, Kenya (1983)

Affiliate Faculty Member, Department of Atmospheric Science, Colorado State University, Fort Collins (1983-1985)

Member, Polar Oceans Climate Studies Panel, Board on Ocean Science and Policy, National Research Council (1984-1987)

Member, Advisory Panel for the Summer Radiation and Climate Modeling Course, National Oceanic and Atmospheric Administration (1986)

Member, Board on Atmospheric Sciences and Climate, National Research Council; Chairman, NOAA Review Panel (1985-1988)

Chair, Advisory Panel for Planet Earth film, *Climate Puzzle*, National

Research Council (1986)

Chairperson, Earth Sciences Research Associateship Program, National Research Council (1986)

Member, Editorial Board, *Climate Dynamics* (1986-1989)

Member, San Diego Supercomputer Center Computer Allocation Committee (1986)

Member, Advisory Committee to David Skaggs (Member of the U.S. House of Representatives Committee on Science, Space and Technology) (1987-1989)

Member, National Oceanic and Atmospheric Administration Panel on Climate and Global Change (1987-1991)

Cooperating Investigator, SPECMAP (1988-1992)

Member, University Corporation for Atmospheric Research President Search Committee (1988)

Member, University Corporation for Atmospheric Research Visiting Scientist Programs Steering Committee (1988-1992) and Chair (1989-1992)

Member, National Aeronautics and Space Administration's Greenhouse Detection Project Science Working Group (1989-1991)

Member, International Working Group on Global Change, National Science Foundation Representative (1989-1990)

Member, Investigator Working Group of the National Aeronautics and Space Administration's Earth Observing System (1990)

Member, Secretary of Energy Advisory Board (1990-1993)

President, Black Environmental Science Trust (1990-1995)

Member, Earth Observing System (EOS) External Engineering Review, appointed by the National Aeronautics and Space Administration and the White House National Space Council (1991)

Member, National Advisory Committee for First National Minority Environmental Leadership Summit, sponsored by the United Church of Christ Commission for Racial Justice (1991)

Member, National Council of the Environmental Defense Fund (1992-2007)

Member, External Advisory Panel of the National Science Foundation's Science and Technology Center for the Study of Clouds, Chemistry and Climate (1992-1994)



Member, Commission on Geosciences, Environment, and Resources, National Research Council (1992-1994)

Member, Advisory Committee of the Minority Media Information Center at the Scientists' Institute for Public Information (1993-1994)

Member, Modernization Transition Committee of the National Weather Service, U.S. Department of Commerce (1993-1998)

Member, the National Committee, American Association for the Advancement of Science Center for Science and Engineering (1994-2007)

Member, Board on Sustainable Development, National Research Council (1995-1998)

Member, National Centers for Environmental Prediction (NCEP) Advisory Panel, (1995-1997)

Member, the UCAR Education Committee, (1995-1996)

Member, NASA Earth Systems Science and Applications Advisory Committee (ESSAAC), (1998-2001)

Member, Board of Trustees of the Bermuda Biological Station for Research, (1998-2002)

Member, NOAA Science Advisory Board, (1998-2002)

American Meteorological Society, History of the Atmospheric Sciences Committee, (2002-2005)

Member of Corporation for Woods Hole Oceanographic Institution, (1999-2002)

Member, Secretary of Energy Biological and Environmental Research Advisory Committee (1990-2014)

Co-Chair of NCAR Community Climate System Model (CCSM) Climate Change and Assessment Working Group, (1999-present)

Member of National Energy Research Scientific Computing Center (NERSC) Policy Board of the Lawrence Berkeley National Laboratory, (1999-2000)

AMS Awards Committee, (2000-2002)

Member of DOE Advanced Scientific Computing Advisory Committee, (2000-2002)

National Science Foundation Vannevar Bush Award Committee, (2001)

Member of U.S. Commission on Ocean Policy Science Advisory Panel, (2002-2007)  
Elected to the National Academy of Engineering (2002)

Elected to the American Philosophical Society (2003)

Member National Academies of Science Coordinating Committee on Global Change, (2003-2005)

NOAA Research Review Panel (2003)

Member of Survey Steering Committee for Earth Sciences and Applications from Space: A Community Assessment and Strategy for the Future. National Research Council, (2004-2006)

Member of Advisory Committee of the International Risk Governance Council (2004-2006)

Member of Advisory Committee of the AAAS Center for Advancing Science & Engineering Capacity, (2005-2006)

Chair of AMS Development Committee (2005-2007)

Member, American Philosophical Society Class 1 Committee on Memberships (2005-2008 and Chair 2009-2012)

Member, National Center for Computational Sciences Advisory Committee, Oak Ridge National Laboratory's (ORNL) National Center for Computational Sciences (2006-2009)

Chair, American Philosophical Society 2006 Annual Fund Committee (2006)

Member, National Science Board (1995-2006)

Member, National Science Board Programs and Plans Committees: CPP Task Force on the Environment; CPP Task Force on Polar Issues; and Chair of the Merit Review Criteria Task Force, 1996-2002

Elected to Executive Committee of National Science Board, 1998-2000

Member of National Science Board Committee on Strategy and Budget, 2001-2002

Vice-Chair of National Science Board Committee on Programs and Plans, 2001-2002

Elected Chair of National Science Board, May 2002-May 2004

Re-elected Chair of National Science Board May 2004-May 2006

Member, National Academies of Science Space Studies Board (2006-2012)

National Academies of Science Policy and Global Affairs Division (PGA) Committee (2006-2008)

National Academies of Science PGA Committee on Women in Science, Engineering and Medicine (CWSEM) (2007-2009)

13<sup>th</sup> Annual Heinz Award Juror (2007)

Howard University NOAA Center for Atmospheric Sciences (NCAS) Advisory Committee (2006-2008)

National Science Board Public Service Awards (2008)

Member, Board of Directors, National Council for Science and the Environment (2007-2010)

Member, Board of Trustees, the H. John Heinz III Center for Science, Economics and the Environment (2007-2013)

Commission to Engage African Americans on Climate Change (CEAC) (2008-2013)

National Academies of Science, BASC, Panel on Advancing the Science of Climate Change (2008-2010)

Member, Board of Directors, Health Effects Institute (2009-2016)

Member of the National Research Council's Report Review Committee (RRC) (2010-2016)

Member of the HistoryMakers Advisory Committee and its ScienceMakers Advisory Board (2010-2015)

Chair of Section 12 of the National Academy of Engineering (2011-2012)

Member, National Academy of Engineering Committee on Meetings (2011-2014)

Member of IRESM DOE/Pacific Northwest Laboratory Advisory Committee (2009-2013)

National Research Council Committee on NASA's Strategic Direction and the Need for a National Consensus (2012-2013)

Chair, NRC Committee to Advise the U.S. Global change Research Program (USGCRP) (2011-2017)

Member of the Scientific Advisory Committee for the ORNL Energy and Environmental Sciences Directorate (2012-2014)

Chair of National Research Committee Panel to Review the National Climate Assessment (2012-2013)

Member of the American Meteorological Society Awards Committee (2014)

Member of the American Geophysical Union Centennial Task Force (2015)

Member, American Geophysical Union (AGU) College of Fellows Task Force (2016)

## PRINCIPAL PUBLICATIONS:

- Washington, W.M., 1964: A note on the adjustment towards geostrophic equilibrium in a simple fluid system. *Tellus*, 16, 530--534. Also in *Selected Meteorological Papers*, No. 15, Dynamic Meteorology (Part I), compiled by the Meteorological Society of Japan, March 1973, 85-89.
- Houghton, D., A. Kasahara, and W. Washington, 1966: Long-term integration of the barotropic equations by the Lax-Wendroff method. *Monthly Weather Review*, 94, 141-150.
- Kasahara, A. and W.M. Washington, 1966: A report on the general circulation experiments at NCAR. *Proceedings of Symposium on the Arctic Heat Budget and Atmospheric Circulation*, 31 January-4 February 1966, Lake Arrowhead, CA, Memo RM-5233-NSF, 401-410.
- Kasahara, A. and W.M. Washington, 1967: NCAR global general circulation model of the atmosphere. *Monthly Weather Review*, 95, 389-402.
- Washington, W.M. and A. Kasahara, 1967: Recent progress on general circulation experiments at NCAR. *Proceedings of Technical Exchange Conference*, 4-7 April 1967, Monterey, CA, AWS Tech. Rept. 196, 162-171.
- Washington, W.M., 1968: Computer simulation of the earth's atmosphere. *Science Journal*, 4, 36-41.
- Washington, W.M., B.T. O'Leary, J. Takamine, and D. Robertson, 1968: The application of CRT contour analysis to general circulation experiments. *Bulletin of the American Meteorological Society*, 49, 882-888.
- Blumen, W. and W.M. Washington, 1969: The effect of horizontal shear flow on geostrophic adjustment in a barotropic fluid. *Tellus*, 21, 167-176.
- Houghton, D. and W.M. Washington, 1969: On global initialization of the primitive equations: Part I. *Journal of Applied Meteorology*, 8, 726-737.
- Kasahara, A. and W.M. Washington, 1969: Thermal and dynamical effects of orography on the general circulation of the atmosphere. *Proceedings of the WMO/IUGG Symposium on Numerical Weather Prediction*, 26 November-4 December 1968, Tokyo, Japan, IV-47-56.
- Julian, P.R., W.M. Washington, L. Hembree, and C. Ridley, 1969: On the spectral distribution of large-scale atmospheric kinetic energy. *Journal of the Atmospheric Sciences*, 27, 376-387.
- Washington, W.M., 1970: On the simulation of the Indian monsoon and tropical easterly jet stream with the NCAR general circulation model. *Proceedings of the Symposium on Tropical Meteorology*, 2-11 June 1970, University of Hawaii, Honolulu, HI, sponsored by the American Meteorological Society, WMO JVI-1-6.

- Washington, W.M. and A. Kasahara, 1970: A January simulation experiment with the two-layer version of the NCAR global circulation model. *Monthly Weather Review*, 95, 559-580.
- Washington, W.M. and L.G. Thiel, 1970: *Digitized Global Monthly Mean Ocean Surface Temperatures*. Technical Note, NCAR/TN-54, National Center for Atmospheric Research, Boulder, CO, 30pp.
- Olinger, J.E., R.E. Welck, A. Kasahara, and W.M. Washington, 1970: *Description of NCAR Global Circulation Model*. Technical Note, NCAR/TN-56+STR, National Center for Atmospheric Research, Boulder, CO, 94 pp.
- Washington, W.M., 1971: A model for global weather forecasting and climate study. *Proceedings of Annual Meeting and Equipment Exposition of the Institute of Environmental Sciences*, April 1971, Los Angeles, CA.
- Washington, W.M., 1971: On the possible uses of global atmospheric models for the study of air and thermal pollution. *Man's Impact on the Climate*, W.H. Matthews, W.W. Kellogg and G.D. Robinson, editors, MIT Press, Cambridge, MA, Part V, 18, 265-276.
- Washington, W.M., 1971: On the role of radiation in dynamical climate simulation and numerical weather prediction. *Proceedings of the Remote Sensing Workshop*, 29-31 March 1971, Miami, FL.
- Kasahara, A. and W.M. Washington, 1971: General circulation experiments with a six-layer NCAR model including orography, cloudiness, and surface temperature calculations. *Journal of the Atmospheric Sciences*, 28, 657-701.
- Houghton, D., D. Baumhefner, and W.M. Washington, 1971: On global initialization of the primitive equations: Part II, The divergent component of the horizontal wind. *Journal of Applied Meteorology*, 10, 626-634.
- Welck, R.E., A. Kasahara, W.M. Washington, and G. DeSanto, 1971: The effect of horizontal resolution in a finite-difference model of the general circulation. *Monthly Weather Review*, 99, 673-683.
- Washington, W.M., 1972: On the possible uses of global atmospheric models for the study of air pollution. *Air and Water Pollution*, W. Brittin, R. West, and R. Williams, editors, Colorado Associated University Press, Boulder, CO, pp. 599-613.
- Washington, W.M., 1972: Development of a three-dimensional stratospheric global circulation model at the National Center for Atmospheric Research (NCAR). *Proceedings of the Second Conference on the Climatic Impact Assessment Program* sponsored by the Department of Transportation, 14-17 November 1972, Cambridge, MA, DOT-TSC-OST-73-4, 358-362.

- Washington, W.M., 1972: Numerical climatic-change experiments: The effect of man's production of thermal energy. *Journal of Applied Meteorology*, 11, 768-772.
- Washington, W.M., 1972: Parameterization of surface temperature calculation, soil moisture, snow cover and pack ice. Proceedings of the Study Group Conference on the Parameterization of Subgrid Scale Processes, 20-27 March 1972, Leningrad, USSR.
- Washington, W.M., 1973: University use of the NCAR general circulation models. *Atmospheric Technology*, National Center for Atmospheric Research, Boulder, CO, 3, 17-20.
- Blumen W. and W.M. Washington, 1973: Atmospheric dynamics and numerical weather prediction in the People's Republic of China 1949-1966. *Bulletin of the American Meteorological Society*, 54, 502-518.
- Williamson, D.L. and W.M. Washington, 1973: On the importance of precision for short-range forecasting and climate simulation. *Journal of Applied Meteorology*, 12, 1254-1258.
- Kasahara, A., T. Sasamori, and W.M. Washington, 1973: Simulation experiments with a 12-layer stratospheric global circulation model. I. Dynamic effect of the earth's orography and thermal influence of continentality. *Journal of the Atmospheric Sciences*, 30, 1229-1251.
- Washington, W.M., 1974: Brief description of NCAR global circulation model. *Modeling for the First GARP Global Experiment*, Report No. 14, GARP Publications Series, 61-78.
- Washington, W.M. and D.P. Baumhefner, 1974: Use of numerical models for tropical climate simulation and forecasting. *Preprint Volume (Part I) International Tropical Meteorology Meeting*, 31 January-7 February 1974, Nairobi, Kenya, East Africa.
- Williamson, D.L. and W.M. Washington, 1974: Reply to Comments on the importance of precision for short-range forecasting and climate simulation. *Journal of Applied Meteorology*, 13, 602-603.
- Williams, J., R.G. Barry, and W.M. Washington, 1974: Simulation of the atmospheric circulation using the NCAR global circulation model with ice age boundary conditions. *Journal of Applied Meteorology*, 13, 305-317.
- Washington, W.M. and D.P. Baumhefner, 1975: A method of removing Lamb waves from initial data for primitive equation models. *Journal of Applied Meteorology*, 14, 114-119.
- GCM Steering Committee, 1975: *Development and Use of the NCAR GCM, A Report of the GCM Steering Committee*. Technical Note, NCAR/TN-101+STR, National Center for Atmospheric Research, Boulder, CO, 177 pp.

- Schneider, S.H. and W.M. Washington, 1975: Letter: Energy production and climate. *Science*, 187, p. 13.
- Washington, W.M., and S.M. Daggupaty, 1975: Numerical simulation with the NCAR global circulation model of the mean conditions during the Asian-African summer monsoon. *Monthly Weather Review*, 103, 105-114.
- Washington, W.M., 1976: Numerical simulation of the Asian-African winter monsoon. *Monthly Weather Review*, 104, 1023-1028.
- Washington, W.M., 1976: The use of global circulation models for climate simulation and transport of pollution. *Proceedings of the International Conference on Environmental Sensing and Assessment*, 14-19 September 1975, Las Vegas, NV, 2, 26-32.
- Washington, W.M. and D.P. Baumhefner, 1976: The influence of the Gulf of Mexico on baroclinic systems in a GCM. *Proceedings of the Conference on Meteorology over the Gulf of Mexico*, 14-16 January 1976, Texas A&M University, College Station, TX.
- Chervin, R.M., W.M. Washington, and S.H. Schneider, 1976: Testing the statistical significance of the response of the NCAR general circulation model to North Pacific Ocean surface temperature anomalies. *Journal of the Atmospheric Sciences*, 33, 413-423.
- Kao, S.K., C.N. Chi, and W.M. Washington, 1976: Statistical characteristics of three-dimensional particle movement in NCAR general circulation model. *Journal of the Atmospheric Sciences*, 33, 1042-1049.
- Washington, W.M., A.J. Semtner, Jr., C. Parkinson, and L. Morrison, 1976: On the development of a seasonal change sea ice model. *Journal of Physical Oceanography*, 6, 679-685.
- Llewellyn, R.A. and W.M. Washington, 1977: Energy and climate: Regional and global aspects. *Energy and Climate, Studies in Geophysics*, National Academy of Sciences, National Research Council, Washington, DC, 106-118.
- Washington, W.M. and D.L. Williamson, 1977: A description of the NCAR global circulation models. In *Methods in Computational Physics, General Circulation Models of the Atmosphere*, Volume 17, J. Chang, editor, Academic Press, New York, NY, 111-172.
- Washington, W.M., R.M. Chervin, and G.V. Rao, 1977: Effects of a variety of Indian Ocean surface temperature anomaly patterns on the summer monsoon circulation: Experiments with the NCAR general circulation model. *Pure and Applied Geophysics*, 115, 1335-1356. Also appearing in *Contributions to Current Research in Geophysics (CCRG), Monsoon Dynamics*, Vol. 4, T.N. Krishnamurti, editor, Birkhauser Verlag, Basel and Stuttgart, 1978.

- Washington, W.M., B. Otto-Bliesner, and G. Williamson, 1977: *January and July Simulation Experiments with the 2.5° Latitude-Longitude Version of the NCAR General Circulation Model*. Technical Note, NCAR/TN-123+STR, National Center for Atmospheric Research, Boulder, CO, Vol. 1, Text, 39 pp.; Vol. 2, Figs., 61 pp.
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- Parkinson, C. and W. Washington, 1979: A large-scale numerical model of sea ice. *Journal of Geophysical Research*, 84, 311-337.
- Washington, W.M. and R.M. Chervin, 1979: Regional climatic effects of large-scale thermal energy consumption: Simulation studies with the NCAR general circulation model. *Journal of Applied Meteorology*, 18, 3-16.
- Washington, W.M., R.E. Dickinson, V. Ramanathan, T. Mayer, D. Williamson, G. Williamson, and R. Wolski, 1979: Preliminary atmospheric simulation with the third-generation NCAR general circulation model: January and July. *Report of the JOC Study Conference on Climate Models: Performance, Intercomparison and Sensitivity Studies*, 3-7 April 1978, Washington, DC, GARP Publication Series No. 22, WMO, Geneva, Vol. I, 95-138.
- Forderhase, K., W.M. Washington, R.M. Chervin, V. Ramanathan, D.L. Williamson, and D.J. Knight, 1980: *Lower Boundary Conditions for the NCAR Global Circulation Model: Ocean Surface Temperatures, Sea Ice, Snow Cover, Continental Surface Albedos and Surface Emissivity, Subsurface Continental Temperatures and Mountain Heights*, Technical Note, NCAR/TN-157+STR, National Center for Atmospheric Research, Boulder, Colorado, 58 pp.
- Washington, W.M., 1980: A review of general circulation model experiments on the Indian Monsoon. Chapter 7 in *Monsoon Dynamics*, J. Lighthill and R.P. Pearce, editors, Cambridge University Press, Cambridge, England, 111-130.
- Parkinson, C.L. and W.M. Washington, 1980: Summary of a large-scale sea-ice model. *Sea Ice Processes and Models, Proceedings of Arctic Ice Dynamics Joint Experiment/International Commission on Snow and Ice Symposium*, R.S. Pritchard, editor, University of Washington Press, Seattle, WA, 224-233.
- Washington, W.M. and R.M. Chervin, 1980: Response time of an atmospheric general circulation model to changes in ocean surface temperature: Implications for interactive large-scale atmosphere and ocean models. *Tellus*, 32, 119-123.
- Washington, W.M. and V. Ramanathan, 1980: Climatic response due to increased CO<sub>2</sub>: Status of model experiments and the possible role of the oceans. *Proceedings of the Carbon Dioxide and Climate Research Program Conference*, 24-25 April 1980, Washington, D.C., Carbon Dioxide Effects Research and Assessment Program, L.E. Schmitt, editor, Prepared by the Institute for Energy Analysis/Oak Ridge Associated Universities. Work supported by U.S.



- Washington, W.M., A.J. Semtner, G.A. Meehl, D.J. Knight, and T.A. Mayer, 1980: A general circulation experiment with a coupled atmosphere, ocean and sea ice model. *Journal of Physical Oceanography*, 10, 1887-1908.
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