

Michael James McPhaden

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PROFESSIONAL EXPERIENCE

2007-present Director, Global Tropical Moored Buoy Array (GT MBA) Project Office
 Pacific Marine Environmental Laboratory, Seattle, Washington

1998-present Senior Scientist, Pacific Marine Environmental Laboratory, Seattle, Washington

1993-present Affiliate Professor, School of Oceanography, University of Washington

1992-2007 Director, Tropical Atmosphere Ocean (TAO) Array Project Office
 Pacific Marine Environmental Laboratory, Seattle, Washington

1992-1998 Supervisory Oceanographer GM-15, Pacific Marine Environmental Laboratory,
 Seattle, Washington

1991-1992 Oceanographer, GS-15, Pacific Marine Environmental Laboratory, Seattle, Washington

1990-present Senior Fellow, Cooperative Institute for Climate, Ocean, and Ecosystem Studies
 (formerly Joint Institute for the Study of the Atmosphere and Ocean),
 University of Washington

1990-1993 Affiliate Associate Professor, School of Oceanography, University of Washington

1988-1990 Affiliate Assistant Professor, School of Oceanography, University of Washington

1987-present Senior Fellow, Cooperative Institute for Marine and Atmospheric Research (formerly
 Joint Institute for Marine and Atmospheric Research),
 University of Hawaii

1986-1991 Oceanographer GS-14, Pacific Marine Environmental Laboratory, Seattle, Washington

1984-1986 Research Assistant Professor, School of Oceanography, University of Washington

1982-1984 Visiting Research Scientist, Joint Institute for the Study of the Atmosphere and Ocean,
 University of Washington

1980-1982 Research Scientist, Oceanography Section, National Center for Atmospheric Research

EDUCATION

1980 Scripps Institution of Oceanography, Ph.D., Physical Oceanography: Dissertation title: "Models
 of the Equatorial Ocean Circulation"

1973 State University of New York at Buffalo, B.S., Physics, magna cum laude

HONORS AND AWARDS

AGU College of Fellows Distinguished Lecturer, 2021-2022

Listed in Reuters Hot List of Most Influential Climate Scientists, 2021

Listed in Web of Science as Highly Cited Resercher in Cross-Field (Interdisciplinary) Science, 2019,
 2020, 2021

Editors' Citation for Excellence in Refereeing, *Journal of Geophysical Research-Oceans*, 1995, 2016

Sverdrup Gold Medal, American Meteorological Society, 2016

Fellow, American Geophysical Union, 2014

Priestley Lecture, Commonwealth Scientific and Industrial Research Organisation, Australia, 2012

President, American Geophysical Union, 2010 - 2012

Fridtjof Nansen Medal, European Geosciences Union, 2010

Nobel Peace Prize (shared) for contributions to Assessments of the Intergovernmental Panel on
 Climate Change, 2007

Fellow, American Meteorological Society, 2007

Guest Professor, Ocean University of China, 2006
Fellow, the Oceanography Society, 2005
Scientific American “Science & Technology Web Awards” for El Niño Theme Page, 2005
Presidential Rank Award for Meritorious Federal Service, 2004
Listed in Web of Science as Highly Cited Researcher in Geosciences, 2004
Grace Hopper Government Technology Award (“Gracie Award”) for TAO Project Leadership in the Innovative Application of Information Technology, 2003
American Geophysical Union, Frontiers of Geophysics Lecturer, 2002 Western Pacific Geophysics Meeting
American Meteorological Society, Walter Orr Roberts Lecturer, 2002
American Meteorological Society, Special Award for Completing and Maintaining the TAO Array, 1999
Public Service Award, Federal Executive Board, Seattle, 1999
American Geophysical Union, Sverdrup Lecturer, Fall 1998 Meeting
Department of Commerce, Gold Medal, 1997
NOAA/OAR Outstanding Publication Award, 1999, 2000, 2002, 2004
NOAA/PMEL Outstanding Publication Award, 1989–1993, 1995, 1997, 1998, 2007
Phi Beta Kappa

PROFESSIONAL SOCIETIES

The Oceanography Society, 1988–present
American Geophysical Union, 1979–present
The American Meteorological Society, 1978–present
The European Geosciences Union, 2005–present
Marine Technology Society/IEEE, 1990

PROFESSIONAL SERVICE ACTIVITIES

Member, AGU Legacy Committee, 2021-present
Member, Program Advisory Group for the UK-US Changing North Atlantic Program, 2021-present.
Member, Scientific Organizing Committee, WCRP-CLIVAR Workshop on Climate Interactions Among the Tropical Basins, 2021
Co-convenor, AGU Fall Meeting Special Session on ENSO in a Changing Climate, 2020
Member, International CLIVAR ENSO Conceptual Models Focus Group, 2020-present
Session co-chair, International Indian Ocean Science Conference (IIOSC-2020), Goa, India, 2020
Member, International CLIVAR Tropical Basin Interaction Research Focus Group, 2019-present
Member, The Oceanography Society Honors Nomination Committee, 2019-2021
Member, National Research Council Postdoc Mentoring Guide Review Committee, 2019-2020
Co-convenor, ENSO Science Symposium, Hobart, Australia, January 2019
Guest Editor, Ocean Dynamics (50th anniversary Liege Colloquium edition), 2018
Co-convenor, Second workshop on the Korea-US Indian Ocean Scientific (KUDOS) Research Program, San Diego, CA, 2018
Chair, Oceanographic Research Awards Committee, American Meteorological Society, 2019
Member, Awards Oversight Committee, American Meteorological Society, 2019
Member, Oceanographic Research Awards Committee, American Meteorological Society, 2017-2018
Member, Suomi Technology Medal Award Committee, American Meteorological Society, 2018-2019
Co-chair, Scientific Organizing Committee, Fourth International ENSO Conference, Guayaquil, Ecuador, 2018
Member, International review committee for the Tropical Atlantic Observing System, 2017–2018.
Member, Advisory Committee, Centre for Southern Hemisphere Ocean Research (CSHOR), Hobart, Australia, 2017-2022
Co-convenor, First workshop on the Korea-US Indian Ocean Scientific (KUDOS) Research Program, Seoul, South Korea, 2017
Member, Oceanographic Research Awards Committee, American Meteorological Society, 2017-2018
Member, The Oceanography Society Fellows Evaluation Committee, 2017-2019

Member, US IOOE-2 Scientific Steering Committee, 2016 - present
Member, AGU Bowie Medal Committee, 2015-2018
Vice-Chair, AGU Development Board, 2015-2019
Chair, AGU Ethics Committee, 2015-2019
Member, Committee on Researcher Involvement in the AMS, 2015-2017
Member, International CLIVAR ENSO Diversity Task Team, 2015-2018
Convenor, AMS Annual Meeting Special Session on ENSO, Tropical Ocean-Atmosphere Interactions, and
Global Climatic Impacts: 20 Years after TOGA, 2015
Member, RAPID-AMOC Program Advisory Committee, 2014-2019
Member, Indian Ocean GOOS (IOGOOS) Steering Committee, 2014-2019
Member, Scientific Organizing Committee, Third International ENSO Conference,
Guayaquil, Ecuador, 2014
Convenor, AGU Fall Meeting Special Session on the 30th Anniversary of the 1982-1983 El Niño
Chairman, Scientific Organizing Committee, Tropical Atlantic Climate Variability Conference,
Venice, Italy, 2013
President, American Geophysical Union, 2010 - 2012 (President-elect 2008 - 2010;
Past President 2012-2014)
Member, Review Committee, University of Maryland Department of Atmospheric and
Oceanic Science, 2011
Member, IUGG Nominations Committee, 2010-2011
Member, International Scientific Advisory Committee, Centro Internacional para la Investigacion del
Fenomeno de El Niño (CIIFEN), 2010-present
Member, National Academy of Science Advisory Panel on National Security Implications of Climate
Change for U.S. Naval Forces, 2009-2011
Member, MIT/WHOI Joint Program Review Committee, 2009
Member, RAPID-WATCH Program Advisory Committee, 2008-2014
Contributing author, IPCC Fourth Assessment Report, 2007
Convener, IUGG Symposium on Interannual to Interdecadal Climate Variability, 2007
Member, RAPID (Rapid Climate Change) Review Committee, February 2007
Member, Review Committee, Cooperative Institute for Climate and Ocean Research (CICOR), June 2005
President, Ocean Sciences Section, American Geophysical Union, 2002–2004
Member, Executive Committee, AGU Ocean Sciences Section, 2000–2008
Member, IOC/WMO Joint Commission on Oceanography and Marine Meteorology, observations
Coordination Group, 2001–present
Member, International CLIVAR Global Synthesis and Observations Panel, 2004–2015
Member, International CLIVAR Indian Ocean Panel, 2003–present
Member, International CLIVAR Pacific Ocean Panel, 2001–present
Chairman, Tropical Moored Buoy Implementation Panel, 2001–present
Member, International CLIVAR/OOPC OceanSITES Working Group, 2000–present
Editorial Board, Bulletin of the American Meteorological Society, 2001–present
Member, PIRATA Steering Group, 1995–present
Member, International CLIVAR Ocean Observations Panel, 2000–2003
Member, OCEANOBS99 Conference Steering Committee, 1999
Member, AMS Committee on the Interaction of the Sea and the Atmosphere, 1999–2002
Member, O-CLIVAR Steering Group, 1996–1997
Member, Nominations Committee, The Oceanography Society, 1994–1996
Chairman, Pan American Climate Studies Subcommittee on Observations, 1994 –1996
Member, Organizing Committee, Final TOGA Conference, 1994–1995
Chairman, TAO Implementation Panel, 1992–2001
Member, Ocean Observing System Development Panel, 1992–1994
Member, International TOGA Scientific Steering Group, 1992–1994
Member, National Academy of Science Advisory Panel on Near-term Development of Operational Ocean
Observations, 1991 – 1993

Member, WCRP Pacific Panel, 1990 – 1994
 Member, International TOGA Scientific Steering Group Ad Hoc Committee on Moored Current Measurements, 1989
 Member, WOCE Moored Measurements Implementation Panel, 1988 – 1991
 Member, EPOCS Council, 1987 – 1994
 Convener, The ENSO Event of 1986 – 1987 Fall AGU, San Francisco, 1987
 Member, US/PRC bilateral air-sea interaction planning committee, 1986 – 1992
 Member, WOCE Committee on Surface Layer Observations, 1986 – 1988
 Convener, Equatorial Undercurrent Centennial Conference, Fall AGU, San Francisco, 1986
 Co-Convener, Second International TOGA Workshop on Thermal Sampling, Hobart, Australia, November 1986
 Convener, TOGA Thermal Data Center Workshop, Monterey, California, July 1985
 Consultant, CCCO Pacific, Atlantic, and Indian Ocean Panels, 1984 – 1990
 Co-Chairman, Pacific Subsurface Thermal Field Monitoring Steering Group 1984 – 1987
 Member, U.S. Delegation to India, Indo-U.S. bilateral on monsoon variability, Bangalore, India, 1984
 Co-Convener, Pacific Subsurface Thermal Field Monitoring Workshop, Seattle, 1984
 Member, TOGA Pacific Drafting Workshop, Miami, 1983
 Convener, Special Ocean/Atmospheric Sciences session on El Niño 1982 – 1983, Fall AGU Meeting, San Francisco, 1983
 Member, Navy/NOAA Committee on Observational Strategies for Ocean Monitoring, Miami, 1983
 Consultant, FOCAL/SEQUAL Programs, 1982 – 1986
 Member, Tropic Heat Experiment Executive Committee, 1981 – 1982
 Consultant, CAGE Feasibility Study Committee, 1981 – 1982
 Member, Equatorial Theoretical Panel, 1978 – 1984

STUDENT RESEARCH SUPPORT

Ejha Siadari	2021-present
Minghong Liu	2019-2020
Hillary Scannell	2015-2017
Guan Cong	2015-2016
Yi Wang	2011-2013
Jacob Weneprat	2010-2015
Jean-Maxime Jardin	2007
Natalia Stephanova	2005–2008
Xuebin Zhang	2002–2007
Weimin Wang	1994–2000
Xuri Yu	1991–1999
Rusty Brainard	1991–1994
Ken Duvall	1987
Scott Springer	1986–1989
Mary Landsteiner	1985–1987
Jeff Proehl	1984–1988

STUDENT COMMITTEES

University of Washington

Shirley Leung, Ph.D., 2020
Nan-Husn Chi, Ph.D., 2019
Hillary Scannell, M.S. (Chairman), 2018
Jacob Wenegrat, Ph.D. (Chairman), 2015
Chuanli Jiang, Ph.D., 2008
Natalia Stephanova, M.S. (Chairman), 2008
Xuebin Zhang, Ph.D. (Chairman), 2008
Weimin Wang, Ph.D. (Chairman), 2000
Xuri Yu, Ph.D. (Chairman), 1999
Keith Brainard, Ph.D., 1995
Joanna Meunch, Ph.D., 1995
Scott Springer, M.S. (Chairman), Ph.D., 1990
William Kessler, Ph.D., 1989
David Battisti, Ph.D., 1988
Mary Landsteiner, M.S. (Chairman), 1988
Jeff Proehl, Ph.D. (Co-Chairman), 1988

Naval Postgraduate School

Rusty Brainard, Ph.D., 1994

University of Paris - VI

Lucia Bunge, Ph.D., 2006
Christophe Menkes, Ph.D., 1994

University of Toulouse - III

Christelle Bosc, Ph.D., 2008
Sophie Cravatte, Ph.D., 2003
Takeshi Izumo, Ph.D., 2003

École Nationale Supérieure d'Ingénieurs

Jean-Maxime Jardin, B.S., 2007

University of Maryland

Gregory Foltz, Ph.D., 2003

Utah State University

Zachary Johnson, Ph.D., 2020 (est.)

Macquarie University, New South Wales, Australia

Shayne McGregor, Ph.D., 2008

Ocean University of China, Qingdao, China

Yi Wang, Ph.D., 2014

Chinese Academy of Sciences, Qingdao

Guan Cong, Ph.D., 2017

Andhra University, Visakhapatnam, India

B. Praveen Kumar, Ph.D. (thesis examiner), 2014

Anna University, Chennai, India

Simi Mathew, Ph.D. (thesis examiner), 2019

POSTDOC SUPPORT AND SUPERVISION

Sree Lekha Jarugula	2021 - present
Yann Planton	2019 - present
Kandaga Pujiana	2017 - 2021
Lu Dong	2015 - 2017
Aaron Levine	2014 - 2018
Ebenezer Nyadjro	2012 - 2014
Joke Luebbecke	2011 - 2013
Iskhaq Iskandar	2009 - 2011
Motoki Nagura	2008 - 2010
Xuebin Zhang	2008
Regina Rodrigues	2005 - 2007
Greg Foltz	2003 - 2006
Weimin Wang	2000
Dongxiao Zhang	1999 - 2001
Daniela Turk	1999 - 2001
Xuri Yu	1999
Chris Meinen	1998 - 2000
Kenong Bi	1995 - 1996
Meghan Cronin	1993 - 1995
Janet Sprintall	1992 - 1993
Eric Johnson	1990 - 1992

UNDERGRADUATE MENTORING

Robert van der Drift, North Carolina State University, NOAA Hollings Summer Intern, 2020
Alex Hewitt, University of Washington, NOAA Lapenta Summer Intern, 2021

VISITING FELLOW SUPPORT

Dr. Roxy Mathew Koll (NRC Fellow), Indian Institute of Tropical Meteorology, India, 2018-2019
Dr. Wahyu Pandoe (Fulbright Fellow), Agency for the Assessment and Application of Technology (BPPT), Indonesia, 2014
Dr. Kunio Kutsuwada, Tokai University, 2000-2001
Dr. Kentaro Ando, Japan Agency for Marine-Earth Science and Technology (JAMSTEC), 1994-1995
Dr. Yoshifumi Kuroda, Japan Agency for Marine-Earth Science and Technology (JAMSTEC), 1990-1991

TEACHING EXPERIENCE

Lecturer, ECCO Summer School, Friday Harbor, Washington, May 2019
Lecturer, GODAE OceanView International School: New Frontiers in Operational Oceanography, Mallorca, Spain, October 2017
Lecturer, CLIVAR-IPRC-WCRP ENSO Summer School, Puna, Hawaii, June 2008
Guest Lecturer, University of Washington, Ocean500: Current Problems in Oceanography, 2005, 2006, 2009
Lecturer, University of Rhode Island Summer School on Equatorial Dynamics, June 1991

OCEANOGRAPHIC RESEARCH CRUISES

RV *Baruna Jaya VII*, 20 February-9 March 2017, Jakarta to Sabang, Indonesia
RV *Fridtjof Nansen*, 18-27 November 2008, Mahe, Seychelles to Pemba, Mozambique
NOAA Ship *Ka'imimoana*, 10-23 September 2006, Nuku Hiva, French Polynesia to Honolulu, Hawaii
(Chief Scientist)
NOAA Ship *Ka'imimoana*, 5-27 April 2005, San Diego, CA to Galapagos Islands, Ecuador
NOAA Ship *Ka'imimoana*, 1-23 March 2002, Honolulu, HI to Galapagos Islands, Ecuador (Chief Scientist)
NOAA Ship *Ka'imimoana*, 27 September-15 October 1997, San Diego, CA to Nuku Hiva, French Polynesia
(Chief Scientist)

RV *Le Noroit*, 2-18 February 1992, Kwajalein, Marshall Islands to Noumea, New Caledonia
RV *Le Noroit*, 26 March-4 April 1991, Kwajalein, Marshall Islands to Noumea, New Caledonia
NOAA Ship *Malcolm Baldrige*, 20 April-22 May 1990, Honolulu, HI to Rodman, Panama (Chief Scientist)
Xiangyanghong #14, 12-28 October 1987, Pohnpei, Micronesia to Republic of Nauru
NOAA Ship *Oceanographer*, 17 October-10 November 1986, Seattle, WA to Manzanillo, Mexico
(Chief Scientist)
RV *Marion Dufresne*, May-July 1983, Dakar, Senegal to La Reunion

REFEREED PUBLICATIONS

- De Rovere, F., D. Zanchettin, M.J. McPhaden, and A. Rubino, 2022: Assessment of radiative heating errors in Tropical Atmosphere Ocean Array marine air temperature measurements. *Environ. Res. Lett.*, 17.014040, DOI:10.1088/1748-9326/ac42fc.
- Guan, C., F. Tian, M.J. McPhaden, F. Wang, S. Hu, and R.-H. Zhang, 2022: Zonal structure of tropical Pacific surface salinity anomalies affects ENSO intensity and asymmetry. *Geophysical Research Letters*, 49, e2021GL096197. <https://doi.org/10.1029/2021GL096197>.
- Cai, W., A. Santoso, M. Collins, et al., 2021: Changing Niño-Southern Oscillation in a warming climate. *Nat. Rev. Earth Environ.* <https://doi.org/10.1038/s43017-021-00199-z>.
- Cai, W., B. Ng, T. Geng, L. Wu, A. Santoso, and M.J. McPhaden, 2021: Addendum: Butterfly effect and a self-modulating El Niño response to global warming. *Nature*. 126, e2020JC016840. <https://doi.org/10.1038/s41586-021-03261-4>.
- Capotondi, A., A.T. Wittenberg, J.-S. Kug, K. Takahashi, and M.J. McPhaden, 2021: ENSO Diversity. In El Niño Southern Oscillation in a Changing Climate (eds M.J. McPhaden, A. Santoso and W. Cai). *AGU Monograph*, doi:10.1002/9781119548164.ch4.
- Feng, M., Y. Zhang, H.H. Hendon, M.J. McPhaden, and A.G. Marshall, 2021: Niño 4 west (Niño-4 W) sea surface temperature variability. *J. Geophys. Res.*, 126, e2021JC017591. <https://doi.org/10.1029/2021JC017591>.
- Girishkumar, M.S., J. Joseph, M.J. McPhaden, and E. Pattabhi Rama Rao, 2021: Atmospheric Cold Pools and Their Influence on Sea Surface Temperature in the Bay of Bengal. *J. Geophys. Res.*, 126, e2021JC017297. <https://doi.org/10.1029/2021JC017297>.
- Iskandar, I., M. Nagura, and M.J. McPhaden, 2021: Role of the eastern boundary-generated waves on the termination of 1997 Indian Ocean Dipole event. *Geosci. Lett.* 8, 35. <https://doi.org/10.1186/s40562-021-00205-8>.
- Jin, Y., Z. Liu, and M.J. McPhaden, 2021: A Theory of the Spring Persistence Barrier on ENSO. Part III: The Role of Tropical Pacific Ocean Heat Content, *J. Climate*, 34, 8567-8577. <https://doi.org/10.1175/JCLI-D-21-0070.1>.
- Karamperidou, C., M.F. Stuecker, A. Timmermann, K.-S. Yun, S.-S. Lee, F.-F. Jin, A. Santoso, M.J. McPhaden, and W. Cai, 2021: ENSO in a Changing Climate: Challenges, Paleo-Perspectives, and Outlook. In El Niño Southern Oscillation in a Changing Climate (eds M.J. McPhaden, A. Santoso and W. Cai). *AGU Monograph*, doi:10.1002/9781119548164.ch21.
- Lee, J., Y.Y. Planton, P.J. Gleckler, K.R. Sperber, E. Guilyardi, A.T. Wittenberg, M.J. McPhaden and G. Pallotta, 2021: Robust evaluation of ENSO in climate models: How many ensemble members are needed? *Geophys. Res. Lett.*, 48, e2021GL095041. <https://doi.org/10.1029/2021GL095041>.

- McPhaden, M.J., A. Santoso, and W. Cai, 2021: Introduction to El Niño Southern Oscillation in a Changing Climate. In *El Niño Southern Oscillation in a Changing Climate* (eds M.J. McPhaden, A. Santoso and W. Cai). *AGU Monograph*, doi:10.1002/9781119548164.ch1.
- McPhaden, M.J., T. Lee, S. Fournier, and M.A. Balmaseda, 2021: ENSO Observations. In *El Niño Southern Oscillation in a Changing Climate* (eds M.J. McPhaden, A. Santoso and W. Cai). *AGU Monograph*, doi:10.1002/9781119548164.ch3.
- Nagura, M. and M.J. McPhaden, 2021: Interannual variability in sea surface height at southern mid-latitudes of the Indian Ocean. *J. Phys. Oceanogr.*, *51*, 1595-1609. <https://doi.org/10.1175/JPO-D-20-0279.1>.
- Nagura, M., and M.J. McPhaden, 2021: Predicting interannual variability in sea surface height along the west coast of Australia using a simple ocean model. *Geophysical Research Letters*, *48*, e2021GL094592. <https://doi.org/10.1029/2021GL094592>.
- Planton, Y.Y., J. Vialard, E. Guilyardi, M. Lengaigne, and M.J. McPhaden, 2021: The Asymmetric Influence of Ocean Heat Content on ENSO Predictability in the CNRM-CM5 Coupled General Circulation Model. *J. Climate*, *34*, 5775-5793. <https://doi.org/10.1175/JCLI-D-20-0633.1>.
- Planton, Y.Y., and co-authors, 2021: Evaluating climate models with the CLIVAR 2020 ENSO metrics package. *Bull. Amer. Meteor. Soc.*, *102*, E193-E217. <https://doi.org/10.1175/BAMS-D-19-0337.1>.
- Power, S., M. Lengaigne, A. Capotondi, M. Khodri, J. Vialard, B. Jebri, E. Guilyardi, S. McGregor, J.-S. Kug, M. Newman, M. J. McPhaden, G. Meehl, D. Smith, J. Cole, J. Emile-Geay, D. Vimont, A.T. Wittenberg, M. Collins, G.-I. Kim, W. Cai, Y. Okumura, C. Chung, K.M. Cobb, F. Delage, Y.Y. Planton, A. Levine, F. Zhu, J. Sprintall, E. Di Lorenzo, X. Zhang, J.-J. Luo, X. Lin, M. Balmaseda, G. Wang, B.J. Henley, 2021: Decadal climate variability in the tropical Pacific: characteristics, causes, predictability and prospects. *Science*, *374*, eaay9165. DOI: 10.1126/science.aay9165.
- Pujiana, K., and M.J. McPhaden, 2021: Biweekly mixed Rossby-gravity waves in the equatorial Indian Ocean. *J. Geophys. Res.*, *126*, e2020JC016840. <https://doi.org/10.1029/2020JC016840>.
- Pujiana, K. and M.J. McPhaden, 2021: Intraseasonal Kelvin waves in the equatorial Indian Ocean and their propagation into the Indonesian Seas. *J. Geophys. Res.*, *25*. <https://doi.org/10.1029/2019JC015839>.
- Shroyer, E., et al., 2021: Bay of Bengal Intraseasonal Oscillations and the 2018 Monsoon Onset. *Bull. Am. Meteorol. Soc.* <https://doi.org/10.1175/BAMS-D-20-0113.1>.
- Yu, J.-Y., E. Campos, Y. Du, T. Eldevik, S.T. Gille, T. Losada, M.J. McPhaden, and L.H. Smedsrud, 2021: Variability of the Oceans. In: *Interacting Climates of Ocean Basins* (C.R. Mechoso, Ed.). *Cambridge University Press*, Cambridge, UK, 358pp.
- Zhang, L., W. Han, G.A. Meehl, A. Hu, N. Rosenbloom, T. Shinoda, and M.J. McPhaden, 2021: Diverse Impacts of the Indian Ocean Dipole on El Niño-Southern Oscillation. *J. Climate*, *34*, 9057-9070. <https://journals.ametsoc.org/view/journals/clim/34/22/JCLI-D-21-0085.1.xml>.
- Beal, L.M., J. Vialard, M.K. Roxy, J. Li, M. Andres, H. Annamalai, M. Feng, W. Han, R. Hood, T. Lee, M. Lengaigne, R. Lumpkin, Y. Masumoto, M.J. McPhaden, M. Ravichandran, T. Shinoda, B.M. Sloyan, P.G. Strutton, A.C. Subramanian, T. Tozuka, C.C. Ummenhofer, A.S. Unnikrishnan, J. Wiggert, L. Yu, L. Cheng, D.G. Desbryères, and Parvathi, 2020: A roadmap to IndOOS-2: Better observations of the rapidly-warming Indian Ocean. *Bull. Am. Meteorol. Soc.*, *101*. E1891-E1913. [doi:https://doi.org/10.1175/BAMS-D-19-0209.1](https://doi.org/10.1175/BAMS-D-19-0209.1)

- Cai, W., M.J. McPhaden, A.M. Grimm, et al., 2020: Climate impacts of the El Niño-Southern Oscillation on South America. *Nat. Rev. Earth Environ.*, 1, 215-231. <https://doi.org/10.1038/s43017-020-0040-3>.
- Cai, W., B. Ng, T. Geng, L. Wu, A. Santoso, and M.J. McPhaden, 2020 Butterfly effect and a self-modulating El Niño response to global warming. *Nature*, 585, 68-73. <https://doi.org/10.1038/s41586-020-2641-x>.
- Chikamoto, Y., Z.F. Johnson, S.-Y. Simon Wang, M.J. McPhaden, and T. Mochizuki, 2020: El Niño Southern Oscillation evolution modulated by Atlantic forcing. *J. Geophys. Res.*, 125, e2020JC016318. <https://doi.org/10.1029/2020JC016318>.
- Girishkumar, M.S., K. Ashin, M.J. McPhaden, B. Balaji, and B. Praveenkumar, 2020: Estimation of vertical heat diffusivity at the base of the mixed layer in the Bay of Bengal. *J. Geophys. Res.*, 125, e2019JC015402. <http://dx.doi.org/10.1029/2019JC015402>.
- Hu, S., J. Sprintall, C. Guan, M.J. McPhaden, F. Wang, D. Hu, and W. Cai, 2020: Deep-reaching acceleration of global mean ocean circulation over the past two decades, *Sci. Adv.*, 6, eaax7727.
- Hu, Z.-Z., A. Kumar, B. Huang, J. Zhu, M. L'Heureux, M.J. McPhaden, and J.-Y. Yu, 2020: The Interdecadal Shift of ENSO Properties in 1999/2000: A Review. *J. Climate*, 33, 4441-4462. <https://doi.org/10.1175/JCLI-D-19-0316.1>.
- Hu, Z.-Z., M.J. McPhaden, A. Kumar, J.-Y. Yu, B. Huang, and N.C. Johnson, 2020: Uncoupled El Niño Warming. *Geophys. Res. Lett.*, 47, e2020GL08762. DOI: 10.1029/2020GL087621.
- Johnson, Z. F., Y. Chikamoto, S.S. Wang, M.J. McPhaden, and T. Mochizuki, 2020: Pacific decadal oscillation remotely forced by the equatorial Pacific and the Atlantic Oceans. *Clim. Dyn.*, 55, 789-811. <https://doi.org/10.1007/s00382-020-05295-2>.
- Joseph, J., M.S. Girishkumar, M.J. McPhaden, and E. Pattabhi Rama Rao, 2020: Diurnal variability of atmospheric cold pool events and associated air-sea interactions in the Bay of Bengal during the summer monsoon. *Clim. Dyn.* 56, 837-853. <https://doi.org/10.1007/s00382-020-05506-w>.
- Pujiana, K. and M.J. McPhaden, 2020: Intraseasonal Kelvin waves in the equatorial Indian ocean and their propagation into the Indonesian seas. *J. Geophys. Res.*, 125, e2019JC015839. <https://doi.org/10.1029/2019JC015839>.
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