

JOSH K. WILLIS

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EDUCATION

PH.D. OCEANOGRAPHY 2004
Scripps Institution of Oceanography, University of California, San Diego *La Jolla, California*
DISSERTATION: *Combining satellite and in situ data to make improved estimates of upper-ocean thermal variability on eddy to global scales* ADVISOR: DEAN ROEMMICH

M.S. PHYSICS 1998
University of California, San Diego *La Jolla, California*

B.S. PHYSICS AND MATH 1996
University of Houston, Honors College *Houston, Texas*

PROFESSIONAL EXPERIENCE

PROJECT SCIENTIST FOR JASON-3 2011 – PRESENT
Jet Propulsion Laboratory, Pasadena, California

DEPUTY PROJECT SCIENTIST FOR JASON-1 AND JASON-2 2009 – PRESENT
Jet Propulsion Laboratory, Pasadena, California

SCIENTIST 2006 – PRESENT
Jet Propulsion Laboratory, Pasadena, California

CALTECH POSTDOCTORAL SCHOLAR 2004 – 2006
Jet Propulsion Laboratory, Pasadena, California

GRADUATE STUDENT RESEARCHER 1996 – 2004
University of California, San Diego, La Jolla, California

MEMBERSHIP AND SERVICE IN TECHNICAL ORGANIZATIONS

Co-Chair, Ocean Surface Topography Science Team
Member, US Argo Science and Implementation Panel
Member, Ocean Salinity Science Team
Member, GRACE Science Team
Member, Atlantic Meridional Overturning Circulation Science Team
Member, CLIVAR Global Synthesis and Observations Panel
Member, American Geophysical Union

AWARDS AND HONORS

2007 Contributing author to the IPCC Fourth Assessment Report (Chapter 5)
2008 Dr. Charles K. Witham Environmental Stewardship Award, JPL
2009 Ranger Award for contributions to the Jason-1 and Jason-2 Missions, JPL
2009 Presidential Early Career Award for Scientists and Engineers (PECASE)
2009 JPL Lew Allen Award for Excellence
2011 AGU Ocean Sciences Early Career Award

RESEARCH INTERESTS

Observing changes in global and regional sea level and their causes using data from satellite altimeters, gravimeters and in situ observation. Understanding the role of the ocean in the global climate system and changes in the general circulation of the ocean and their impact on the transport of heat by the ocean.

MENTORING

Postdoctoral Scholar: William Hobbs, Sept. 2009 – present

Undergraduate Student Interns: Kyung Choi, 2005
 Yang-qing Wang, 2005
 Teni Mardirosian, 2005-2006
 Arbi Tamrazian, 2006-2007
 Robert Karl, 2007-2008
 Ann Bui, 2009 – 2011
 Dan Killam, 2008 – present

PEER-REVIEWED PUBLICATIONS

- Willis, J. K.**, D. Roemmich, and B. Cornuelle (2003), Combining altimetric height with broadscale profile data to estimate steric height, heat storage, subsurface temperature, and sea-surface temperature variability, *J. Geophys. Res.*, 108 (C9), 3292.
- Willis, J. K.**, D. Roemmich, and B. Cornuelle (2004), Interannual variability in upper-ocean heat content, temperature and thermosteric expansion on global scales, *J. Geophys. Res.*, 109 (C12036).
- Roemmich, D., J. Gilson, **J. Willis**, P. Sutton, K. Ridgway (2005), Closing the time-varying mass and heat budgets for large ocean areas: The Tasman Box, *J. Climate*, 18(13).
- Hansen, J., L. Nazarenko, R. Ruedy, M. Sato, **J. Willis**, A. Del Genio, D. Koch, A. Lacis, K. Lo, S. Menon, T. Novakov, J. Perlwitz, G. Russell, G.A. Schmidt, N. Tausnev (2005), Earth's Energy Imbalance: Confirmation and Implications, *Science*, 308.
- G. C. Johnson, J. M. Lyman, **J. K. Willis** (2006), "Heat Content", in State of the Climate in 2005. Shein, K.A., ed., *Bulletin of the American Meteorological Society*, 87, S23-S34.
- Wong, T., B. A. Wielicki, R. B. Lee, G.L. Smith, K. A. Bush, and **J. K. Willis** (2006), Re-examination of the observed decadal variability of earth radiation budget using altitude-corrected ERBE/ERBS nonscanner WFOV data, *J. Climate*, 19(16), pp. 4028–4040.
- Lyman, J., **J. K. Willis**, G. Johnson (2006), Recent cooling of the upper ocean, *Geophys. Res. Lett.*, 33, L18604, doi:10.1029/2006GL027033.
- Willis, J. K.**, J. M. Lyman, G. C. Johnson, and J. Gilson (2007), Correction to "Recent cooling of the upper ocean". *Geophys. Res. Lett.*, 34, L16601, doi:10.1029/2007GL030323.
- Johnson, G. C., J. M. Lyman, and **J. K. Willis** (2007), "Global Oceans: Heat Content," *In State of the Climate in 2006*, A. Arguez, Ed., *Bulletin of the American Meteorological Society*, 88, 6, S31-S33.
- Willis, J.K.**, D. P. Chambers, R. S. Nerem (2008), Assessing the Globally Averaged Sea Level Budget on Seasonal to Interannual Time Scales, *J. Geophys. Res.*, 113, C06015, doi:10.1029/2007JC004517.

- Tamrazian, A., S. LaDochy, **J. Willis**, and W. C. Patzert (2008), Heat Waves in Southern California: Are They Becoming More Frequent and Lasting Longer?, *Yearbook of the APCG*, *70*, 59-69.
- Johnson, G. C., J. M. Lyman, and **J. K. Willis** (2008), Global Oceans: Ocean Heat Content. In State of the Climate in 2007, D. H. Levinson and J. H. Lawrimore, Eds., *Bulletin of the American Meteorological Society*, *89*, 7, S39–S41, doi: 10.1175/BAMS-89-7-StateoftheClimate.
- Wijffels, S.E., **J. Willis**, C.M. Domingues, P. Barker, N.J. White, A. Gronell, K. Ridgway, and J.A. Church (2008), Changing Expendable Bathythermograph Fall Rates and Their Impact on Estimates of Thermosteric Sea Level Rise. *J. Climate*, *21*, 5657–5672.
- Willis J. K.**, L.-L. Fu (2008), Combining altimeter and subsurface float data to estimate the time-averaged circulation in the upper ocean, *J. Geophys. Res.*, *113*, C12017, doi:10.1029/2007JC004690.
- Chambers D. P., **J. K. Willis** (2008), Analysis of large-scale ocean bottom pressure variability in the North Pacific, *J. Geophys. Res.*, *113*, C11003, doi:10.1029/2008JC004930.
- Dickey J. O., S. L. Marcus, **J. K. Willis**, Ocean cooling: Constraints from changes in Earth's dynamic oblateness (J 2) and altimetry (2008), *Geophys. Res. Lett.*, *35*, L18608, doi:10.1029/2008GL035115.
- Willis, J.K.**, J.M. Lyman, G.C. Johnson, and J. Gilson (2009), In Situ Data Biases and Recent Ocean Heat Content Variability, *J. Atmos. Oceanic Technol.*, *26*, 846–852.
- Johnson, G. C., J. M. Lyman, **J. K. Willis**, S. Levitus, T. Boyer, J. Antonov, C. Schmid, and G. J. Goni (2009), Global Oceans: Ocean Heat Content, In State of the Climate in 2008, T. C. Peterson and M. O. Baringer, Eds., *Bulletin of the American Meteorological Society*, *90*, 8, S49-S52, doi:10.1175/BAMS-90-8-StateoftheClimate.
- Chambers D. P., **J. K. Willis** (2009), Low-frequency exchange of mass between ocean basins, *J. Geophys. Res.*, *114*, C11008, doi:10.1029/2009JC005518.
- Marcus, S. L., J. O. Dickey, **J. K. Willis**, and F. K. Seitz (2009), Earth oblateness changes reveal land ice contribution to interannual sea level variability, *Geophys. Res. Lett.*, *36*, L23608, doi:10.1029/2009GL041130.
- Content. A Community White Paper for OceanObs09, Venice, Italy.
- Willis, J. K.**, Can In-Situ Floats and Satellite Altimeters Detect Changes in Atlantic Ocean Overturning? (2010), *Geophys. Res. Lett.*, *37*, L06602, doi:10.1029/2010GL042372.
- Lyman, J. M., S. A. Good, V. V. Gouretski, M. Ishii, G. C. Johnson, M. D. Palmer, D. A. Smith, and **J. K. Willis** (2010), Robust warming of the global upper ocean, *Nature*, *465*, 334-337 doi:10.1038/nature09043.
- Johnson, G. C., J. M. Lyman, **J. K. Willis**, S. Levitus, T. Boyer, J. Antonov, M. D. Palmer, and S. A. Good (2010), Global Oceans: Ocean Heat Content, In State of the Climate in 2009, D. S. Arndt, M. O. Baringer, and M. R. Johnson, Eds., *Bulletin of the American Meteorological Society*, *91*, 7, S56-S59, doi:10.1175/BAMS-91-7-StateoftheClimate.
- Roemmich, D., **J. Willis**, J. Gilson, D. Stammer, A. Koehl, T. Yemenis, D. P. Chambers, F. Landerer, J. Marotzke, J. Gregory, T. Suzuki, J. Church, N. White, C. Domingues, A. Cazenave, and P.-Y. LeTraon (2010), Global Ocean Warming and Sea Level Rise, in *Understanding Sea-Level Rise and Variability*, J. A. Church, P. L. Woodworth, T. Aarup, and W. S. Wilson (eds.), Wiley-Blackwell.
- Chambers D. P., **J. K. Willis** (2010), A Global Evaluation of Ocean Bottom Pressure from GRACE, OMCT, and Steric-Corrected Altimetry, *J. Atmos. Oceanic Technol.*, *27*, 1395-1402, doi:10.1175/2010JTECHO738.1.
- Syed, T., J. Famiglietti, D. Chambers, **J. Willis** and K. Hilburn (2010), Increasing Continental Freshwater Discharge from Satellite-Based Global Ocean Mass Balance (1994-2006), *Proc. Natl. Acad. Sci. USA*, published online Oct 4, 2010, doi: 10.1073/pnas.1003292107.
- Lee, T., W. R. Hobbs, **J. K. Willis**, D. Halkides, I. Fukumori, E. M. Armstrong, A. K. Hayashi, W. T. Liu, W. Patzert, and O. Wang (2010), Record warming in the South Pacific and western

Antarctica associated with the strong central-Pacific El Niño in 2009-10, *Geophys. Res. Lett.*, **37**, L19704, doi:10.1029/2010GL044865.

Willis, J.K., D. P. chambers, C.-Y. Kuo, and C. K. Shum (2010), Global Sea Level Rise: Recent Progress and Challenges for the Decade to Come, *Oceanography*, **23**(4), 26-35.

Leuliette, E., and **J. K. Willis** (2011), Balancing the Sea-level Budget, *Oceanography*, **24**(2):122–129, doi:10.5670/oceanog.2011.32.

Hobbs, W., and **J. K. Willis** (2011), Estimates of North Atlantic heat transport from satellite and drifter data, *J. Geophys. Res.*, doi:10.1029/2011JC007039, in press.

OTHER PUBLICATIONS

Willis, J. K., “Combining satellite and in situ data to make improved estimates of upper-ocean thermal variability on eddy to global scales,” Doctoral Dissertation, Scripps Institution of Oceanography, 2004.

Contributing author for Chapter 5, Observations: Oceanic Climate Change and Sea Level, IPCC Fourth Assessment Report, 2007.

Willis, J.K., Is It Me, or Did the Oceans Cool? A Lesson on Global Warming from my Favorite Denier (2008), *U.S. CLIVAR Variations*, 6 (2), U.S. CLIVAR Office.

Palmer, M. D., J. Antonov, P. Barker, N. Bindoff, T. Boyer, M. Carson, C. M. Domingues, S. Gille, P. Gleckler, S. Good, V. Gouretski, S. Guinehut, K. Haines, D. E. Harrison, M. Ishii, G. C. Johnson, S. Levitus, M. S. Lozier, J. M. Lyman, A. Meijers, K. von Shuckmann, D. Smith, S. Wijffels, and **J. Willis** (2009), Future Observations for Monitoring Global Ocean Heat

Willis J., L. Miller, and G. Mountain (2011), Sea Level: An Introduction to the Special Issue, *Oceanography*, **24**(2):22–23, doi:10.5670/oceanog.2011.24.

INVITED PRESENTATIONS AT SCIENTIFIC MEETINGS AS FIRST AUTHOR

Upper-Ocean Thermal Variability on Global Scales: a decade of satellite and in situ measurements (**J. Willis**), NASA Sea Level Meeting, Washington, D.C., April 2005.

Observations of the steric component of sea level rise (**J. Willis** and D. Roemmich), IAMAS Meeting, Beijing, China, August 2005.

Estimating circulation and upper-ocean thermal variability from a combination of satellite, Argo and other in situ data, (**J. Willis** and L.-L. Fu,) CLIVAR, OOPC, GOOS, Argo, CPPS Meeting, Concepción, Chile, October 2005.

Toward closing the globally averaged sea level budget on seasonal to interannual time scales (**J. Willis**, D. P. Chambers, and R. S. Nerem), European Geosciences Union, General Assembly, Vienna, Austria, April 2008.

A new estimate of interannual variability in upper ocean heat content in light of recently discovered in situ data biases (**J. Willis**), European Geosciences Union, General Assembly, Vienna, Austria, April 2008.

Pie in the sky: ocean warming and sea level rise during the era of satellite oceanography (**J. Willis**), William Smith Meeting of the Geological Society, London, U.K, September 2008.

The Day after Yesterday: Good Science, Bad Movies and the Ugly Truth about the AMOC’s Role in Global Climate (**J. Willis**), AMOC Science Team Meeting, Annapolis, MD, May 2009.

Observing Steric Changes in the World Ocean: Argo and the Way Forward (**J. Willis**), NASA Sea Level Workshop, Austin, TX, November 2009.

Warming or Melting? Dissecting the Causes of Sea Level Rise over the Past 16 Years (**J. Willis**), 2009 AGU Fall Meeting, San Francisco, CA, December 2009.

17 Years and Counting: Satellite Altimetry from Research to Operations (**J. Willis**, L.-L. Fu, E. Lindstrom, M. Srinivasan), 2010 IGARRS Meeting, Honolulu, HI, July 2010.

Explaining regional sea level variations during the satellite altimeter era (J. Willis, and I. Fukumori), WCRP/IOC Workshop on Regional Sea Level Change, Paris, France, February 2011.

Steric Contributions to Sea Level Rise: A Global Perspective (J. Willis), Coastal and Estuarine Research Federation (CERF) 2011, Daytona Beach, FL, November 2011.

CURRENT RESEARCH CONTRACTS AND GRANTS

- 2011-2014 NASA: Closing Ocean Salinity and Heat Budgets on Basin Scales in the North Atlantic (Principal Investigator)
- 2011-2013 NASA: Ocean Warming and the Earth's Energy Balance (Principal Investigator)
- 2011-2014 NASA: The Response of Sea Level to Changes in Climate: Has There Been a Fundamental Shift in the Rate of Sea Level Rise? (Co-Investigator)
- 2010-2014 NASA: Assessing the Quality of Aquarius Sea Surface Salinity Measurements Using an Ocean State Estimation System (Co-Investigator)
- 2007-2011 NASA: Monitoring the Atlantic Meridional Overturning Circulation Using a Combination of SST, Altimeter, GRACE, and Argo Data (Principal Investigator)

PREVIOUSLY FUNDED RESEARCH CONTRACTS AND GRANTS

- 2008-2010 NASA: An Independent Assessment of the Contribution of Ice Melt to Sea Level Change (Co-Investigator)
- 2007-2010 NASA: Steric Sea Level Variations from a Combination of GRACE, Jason-1, and Argo Float Data (Co-Investigator)