CURRICULUM VITAE

MARK D. POWELL

NOAA Atlantic Oceanographic and Meteorological Laboratories
Hurricane Research Division
Duty Station: Center of Ocean -Atmospheric Prediction Studies
Florida State University
Telephone: (850) 645-8816
Email:Mark.Powell@noaa.gov
Web Page: http://www.aoml.noaa.gov/hrd/powell/index.html

RESEARCH INTERESTS

Tropical meteorology with a focus on tropical cyclones: realtime wind field monitoring, risk modeling, air-sea interaction, boundary layer structure, rainband structure and dynamics, landfall forecast accuracy, real-time and retrospective landfall investigations, destructive potential, wind damage assessment, and standards for the measurement and archival of surface winds. Additional interests in wind engineering and renewable energy.

EDUCATION

FLORIDA STATE UNIVERSITY
Tallahassee, Florida — B.S. 1975

PENNSYLVANIA STATE UNIVERSITY
State College, Pennsylvania — M.S. 1978 Thesis: Evaluations of diagnostic marine boundary layer models applied to hurricanes. Advisor: Professor Blackadar

FLORIDA STATE UNIVERSITY
Tallahassee, Florida — Ph.D. 1988 Dissertation: Boundary layer structure and dynamics of outer hurricane rainbands. Advisor: Professor Krishnamurti

EXPERIENCE

METEOROLOGIST
NOAA Hurricane Research Division (HRD), AOML Miami FL *1978-present*
Currently leads a group of seven scientists and students involved in boundary layer research and the HRD real-time hurricane wind analysis system (H*Wind) project, which has provided hurricane wind field products (http://www.aoml.noaa.gov/hrd/data_sub/wind.html) for use in forecasting, damage assessment and modeling storm surge and waves. Team leader for meteorological development of the State of Florida Public Hurricane Loss Model. Conducted the first observational study to document the wind speed dependence of the marine drag coefficient in tropical cyclones.

SUMMER STUDENT
National Hurricane Research Laboratory, Miami FL *1977*
Developed a diagnostic boundary layer model, participated in hurricane field program.

SUMMER STUDENT RESEARCH ASSOCIATE
Brookhaven National Laboratory, Brookhaven, NY *1974-1976*
Eastern Long Island sea breeze field program investigations, including pibal launching and tracking, offshore oil fog dispersion and diffusion, airborne monitoring of SST distribution over Great South Bay, Shinnecock inlet, and adjacent ocean waters, tower wind measurements, hot film anemometer calibration.

TEACHING AND RESEARCH ASSISTANTSHIPS
Pennsylvania State University *1975-1978*
TA for General Meteorology labs, Weather forecasting, Tropical Meteorology. Research on applying the Mellor and Yamada Level III closure model to the nocturnal low-level jet (under professor Alfred Blackadar)

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REFEREED PUBLICATIONS

HURRICANE BOUNDARY LAYER

Powell, M.D., P.J. Vickery, and T.A. Reinhold, 2003: "Reduced drag coefficient for high wind speeds in tropical cyclones" *Nature*, 422, March 20 pp. 279-283.

Powell, M. D.,T. A. Reinhold, and R. D. Marshall, 1999: GPS sonde insights on boundary layer wind structure in hurricanes. Wind Engineering into the 21st Century, Larsen, Larose, and Livesey (eds), Balkema, Rotterdam, ISBN 90 5809 059 0

Barnes, G. M. and M. D. **Powell**, 1995: Evolution of the inflow boundary layer of Hurricane Gilbert (1988). Mon. Wea. Rev., 123, 2348-2368.

Powell, M. D., 1990: Boundary layer structure and dynamics in outer hurricane rainbands. Part I: Meso□ scale rainfall and kinematic structure. *Mon. Wea. Rev.*, 118, 891-917.

Powell, M. D., 1990: Boundary layer structure and dynamics in outer hurricane rainbands. Part II: Downdraft modification and mixed layer recovery. *Mon. Wea. Rev.*, 118, 918-938.

HURRICANE IMPACTS

Powell, M. D. and T. A. Reinhold, 2007: Tropical cyclone destructive potential by integrated kinetic en□ ergy. *BAMS*, 88, 513-526.

Powell, M. D. and T. A. Reinhold, 2007: Response to comment by R. Simpson and H. Saffir on "Tropical cyclone destructive potential by integrated kinetic energy." *BAMS*, 88, 1800-1801.

Powell, M. D. and T. A. Reinhold, 2008: Response to comment by L. Kantha on "Tropical cyclone de□ structive potential by integrated kinetic energy." *BAMS*, 89, 221-223.

Powell, M. D. and T. A. Reinhold, 2008: Response to Hsu and Blanchard's comments on "Tropical cy□ clone destructive potential by integrated kinetic energy." *BAMS*, 89, in press.

HURRICANE WIND FIELDS

Moyer, A. C., J. L. Evans, and M. **Powell**, 2007: Comparison of observed gale radius statistics. *Meteorol. Atmos. Phys.*, 97, 41-55.

Rogers, R., S. Aberson, M. Black, P. Black, J. Cione, P. Dodge, J. Dunion, J. Gamache, J. Kaplan, M. **Powell**, N. Shay, N. Surgi, E. Uhlhorn, 2006: The intensity forecasting experiment. *BAMS*, 87, 1523-1537.

Powell, M.D., D. Bowman, D. Gilhousen, S. Murillo, N. Carrasco, and R. St. Fleur, 2004: Tropical Cy□ clone Winds at Landfall: The ASOS-CMAN Wind Exposure Documentation Project. *BAMS*, 85, 845-851.

Powell, M. D., S. H. Houston, L. R. Amat, and N Morisseau-Leroy, 1998: The HRD real-time hurricane wind analysis system. *J. Wind Engineer. and Indust. Aerodyn*. 77&78, 53-64.

Powell, M. D., 1993: Wind measurement and archival under the automated surface observing system (ASOS): User concerns and opportunity for improvement. *BAMS*, 74, 615-623.

Powell, M. D., and P. G. Black, 1990: The relationship of hurricane reconnaissance flight-level wind measurements to winds measured by NOAA's oceanic platforms. *J. Wind Engineer. Indust. Aerodyn.*, 36, 381-392.

HURRICANE LANDFALL

Dunion, J. P., C. W. Landsea, S. H. Houston, and M. D. **Powell**, 2003: A reanalysis of the surface winds for Hurricane Donna of 1960. *Mon. Wea. Rev.*, 131, 1992-2011.

Houston, S. H., and M. D. **Powell**, 2003: Reconstruction of Significant Hurricanes affecting Florida Bay: The Great 1935 Hurricane and Hurricane Donna (1960). *J. Coastal Research*, 19, 503-513.

Book Chapter: Storms Vol. I **Powell**, Mark D., 2000: Tropical cyclones during and after landfall. Routledge Publishing, New York.

Powell, M. D., and S. H. Houston, 1998: Surface wind fields of 1995 Hurricanes Erin, Opal, Luis, Marilyn, and Roxanne at landfall. *Mon Wea. Rev.*, 126, 1259-1273.

Powell, M. D., S. H. Houston, and T. A. Reinhold, 1996: Hurricane Andrew's Landfall in South Florida. Part I: Standardizing measurements for documentation of surface wind fields. Weather Forecast., 11, 304-328.

Powell, M. D., and S. H. Houston, 1996: Hurricane Andrew's Landfall in South Florida. Part II: Surface Wind Fields and Potential Real-time Applications. *Weather. Forecast.*, 11, 329-349.

Powell, M. D. , P. P. Dodge, and M. L. Black, 1991: The landfall of Hurricane Hugo in the Carolinas. *Weather Forecast.*, 6, 379-399.

Powell, M. D., and P. G. Black, 1990: Meteorological aspects of Hurricane Hugo's landfall in the Carolinas. *Shore and Beach*, 58 (4), 3-10.

Powell, M. D., 1987: Changes in the low-level kinematic and thermodynamic structure of Hurricane Alicia (1983) at landfall. *Mon. Weather Rev.*, 115 (1), 75-99.

Powell, M. D., 1982: The transition of the Hurricane Frederic boundary-layer wind field from the open Gulf of Mexico to landfall. *Mon. Weather Rev.*, 110 (12), 1912-1932.

STORM SURGE, WAVES AND SST

Graber, H. C., V. J. Cardone, R. E. Jensen, D. N. Slinn, S. C. Hagen, A. T. Cox, M. D. **Powell**, and C. Grassl, 2006: Coastal forecasts and storm surge predictions for tropical cyclones: A timely partnership program. *Oceanography*, 19, 130-141.

Walsh, E. J., C. W. Wright, D. Vandemark, W. B. Krabill, A. W. Garcia, S. H. Houston, S. T. Murillo, M. D. **Powell**, P. G. Black, and F. D Marks, Jr., 2002: Hurricane directional wave spectrum spatial variation at landfall. *J. Physical Ocean.*, 32, 1667-1684.

Wright, C.W., E.J. Walsh, D. Vandemark, W.B. Krabill, A.W. Garcia, S.H. Houston, M.D. **Powell**, P.G. Black, and F.D. Marks, 2001: Hurricane directional wave spectrum spatial variation in the open ocean. *J.*

Houston, S. H., W. A. Shaffer, M. D. **Powell**, and J. Chen, 1999: Comparisons of HRD and SLOSH surface wind fields in hurricanes: Implications for storm surge and wave modeling. *Wea. Forecast.*, 14, 671-686.

Houston, S. H., and M. D. **Powell**, 1994: Observed and modeled wind and water level response from Tropical Storm Marco (1990). *Weather. Forecast.*, 9,427-439.

Powell, M. D., and S. Sethuraman 1979: Sea surface temperatures near a bay inlet zone. *J. Geophys. Res.*, 84 (C11), November,7012-7016.

MODELING

Westerink, R Luettich, J Feyen, J. Atkinson, C. Dawson, H. Roberts, M. **Powell**, J. Dunion, E. Kubatko, and H. Pourtaheri, 2007: A Basin to Channel Scale Unstructured Grid Hurricane Storm Surge Model Applied to Southern Louisiana, *Mon. Wea. Rev.*, 136, 833-864.

Powell, M. D., G. Soukup, S. Cocke, S. Gulati, N. Morisseau-Leroy, S. Hamid, N. Dorst, and L. Axe, 2005: State of Florida hurricane loss projection model: Atmospheric science component. *J. Wind Engineer. and Indust. Aerodyn.*, 93, 651-674.

Powell, M. D., and S. H. Houston, 1999: Comments on "A multiscale numerical study of Hurricane Andrew (1992). Part I: Explicit simulation and verification." *Mon. Wea. Rev.*, 127, 1706-1710.

Powell, M. D., 1980: Evaluations of diagnostic marine boundary-layer models applied to hurricanes. *Mon. Weather Rev.*, 108 (6), 757-766.

FORECASTING

Powell, M. D., E. Uhlhorn, and J. Kepert, 2008: Estimating maximum surface winds from hurricane reconnaissance aircraft. *Weather Forecast.*, in press.

Powell, M. D., and S. D. Aberson, 2001: Accuracy of United States tropical cyclone landfall forecasts in the Atlantic basin 1976-2000. *BAMS*, 82, 2749-2767.

Powell, M. D. and S. K. Rinard, 1998: Marine Forecasting at the 1996 Centennial Olympic Games. *Weather Forecast.*, 13, 764-782.

W. Burpee, S. D. Aberson, P. G. Black, M. DeMaria, J. L. Franklin, J. S. Griffin, S. H. Houston, J. Kaplan, S. J. Lord, F. D. Marks, Jr., M. D. **Powell**, and H. E. Willoughby, 1994: Real-time guidance provided by NOAA's Hurricane Research Division to forecasters during Emily of 1993. BAMS, 75, 1765-1783.

Powell, M. D., 1993: Wind forecasting for yacht racing at the 1991 Pan American Games. *BAMS*, 74(1), 5-16.

WIND ENGINEERING

Coauthor, NRC Committee Report: 1999: Review of the need for a large-scale test facility for research on the effects of extreme winds on structures. National Research Council, National Academy Press, Washington D. C. ISBN-0-309-06483-X.

Powell, M. D., and P. N. Georgiou, 1987: Response of the Allied Bank Plaza Tower during Hurricane Alicia (1983). *J. Wind Engineer. and Indust. Aerodyn.*, 26, 231-254.

Vickery, P. J., D. Wadhera, **M. D. Powell**, and Y. Chen, 2008: A hurricane boundary layer and wind field model for use in engineering applications. J. App. Meteor. and Climatology, in press.

U. S. WEATHER RESEARCH PROGRAM

Coauthor, USWRP PDT-5 Report, 1998: Tropical Cyclones: Forecast problems and associated research opportunities. *BAMS*, 79, 305-323.

Coauthor, USWRP PDT-3 Report, 1997: Coastal Meteorology and Oceanography: Report of the third prospectus Development team of the USWRP to NOAA and NSF. *BAMS*, 77, 1578-1585.

AWARDS

Department of Commerce Bronze Medal, 2008: For employing a unique technology to diagnose Hurricane Katrina's winds, a technology needed for surge, wave, intensity, and ecosystem modeling efforts.

Certificate of Appreciation for Patriotic Civilian Service, Hurricane Katrina Interagency Performance Evaluation Task Force, Department of the Army 2007

Department of Commerce Bronze Medal, 2007 (group award): For innovation and commitment to the NOAA Hurricane Mission during Katrina's Louisiana landfall while recovering from the South Florida landfall.

Department of Commerce Gold Medal, 1992 (Unit Award for performance in Hurricane Andrew)

Special Recognition Award, 1996: For service as a member of the National Weather Service Forecast Team in support of the 1996 Olympic Games. Savannah, Georgia

"Best JAVA Implementation Award", NOAATech 2000 Conference for "H*Wind Team: A Distributed Real-time Hurricane Wind Analysis System." M. Powell, PI

"Best Transition to Operations Award" NOAATech 2002, to the H*Wind team, M. Powell, PI

Top Ten Author in Tropical Storms cited publications 1996-2006:
http://www.esi-topics.com/tropical/authors/b1a.html

CERTIFICATION

AMS Certified Consulting Meteorologist (seal 475)

MEMBER

American Meteorological Society, American Geophysical Union, American Association for Wind Engineering

TEACHING

Lecturer, WMO Tropical Meteorology Course at NHC (1995-2003), NCAR Advanced Colloquium: Hurricanes at Landfall (1999), Visiting scientist lectureship for Research Week, University of South Alabama (2006), General Meteorology and labs at Miami Dade College (1978-1982)

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ADVISING /MENTORING

Kevin Day University of Florida 1992, Cary Bakker FIU 1996, Philippe Dubosq Florida Institute of Technology 1995, Shirley Murillo Math and Science Technical Academy High School (MAST), FSU Nick Carrasco MAST, U Miami, Russell St. Fleur MAST, FIU, Stephanie Bergman Ohio State 2002, Alex Mendoza U. South Florida 2003, Krizia Negron U. Puerto Rico Rio Piedras 2005, Isha Renta U. Puerto Rico Mayaguez, 2004, 2005, Howard U. 2006, 2007, Adam Moyer, Penn State 2005, Ashley Greene University of Maryland 2007, Ian Giamannco, Texas Tech 2007, Guy Ravitz U. Miami 2007, Jun Zhang NRC Post Doc, 2008

MS COMMITTEES:

Luis Amat, FIU, 1998 "A real-time internet based quality control application for hurricane surface winds"

Nirva Morisseau-Leroy, FIU 1997 "Atmospheric observations, analyses, and the World Wide Web using a semantic database"

Sonia Otero FIU, 2002 "A real-time distributed analysis automation for hurricane surface wind observations"

Nick Carrasco, U. Miami 2007, "Data mining assisted automated quality control of tropical cyclone winds"

CURRENT COMMITTEES

Isha Renta, MS Howard U. 2008 "Evaluation of the surface wind fields of the GFDL forecast using H*Wind"

Benjamin Jaimes, PhD U. Miami, Meteorology and Physical Oceanography, 2008 "Mixed layer entrainment in mesoscale oceanic eddies during hurricane passage"

Guy Ravitz, PhD U. Miami, Computer Engineering, 2009

Ian Giamanco, PhD, Texas Tech, Atmospheric Science, 2009

ACADEMIC AFFILIATIONS

Adjunct Faculty: Howard University

Senior Fellow: Joint Institute for Marine and Atmospheric Research, University of Hawaii - NOAA

Courtesy Faculty: Center for Ocean-Atmospheric Prediction Studies, Florida State University

FIELD EXPERIENCE

1978-1993 Lead project scientist and boundary layer scientist on NOAA P3 during Hurricane Field Program

1986 Genesis of Atlantic Lows Experiment, Lead project scientist on Convair jet and NOAA P3, Raleigh, NC

1993 Tropical Experiment in Mexico experiment, Lead project scientist on NOAA P3, Acapulco Mexico

1979-2005 Post-hurricane damage investigations Hurricanes Frederic, Hugo, Andrew, Irene, Katrina, Wilma

RESEARCH GRANTS

Summary: $3.6 million in solicited or competitive NOAA and external grants as principal investigator (PI) or co-PI.

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RESEARCH GRANTS

1992-1993 $80 k NOAA Coastal Ocean Program: Hurricanes wind field analysis

1993-1996 $200 k Florida Power and Light: Hurricane wind fields for damage assessment and recovery planning

1995 $30 k NOAA Coastal Ocean Program: Episodic events affecting Florida Bay

1997-1999 $332k US Weather Research Program: Tropical cyclone winds at landfall

1998-2000, $225 k NOAA High Performance Computing and Communications: H*Wind

1998-2000, $225 k National Institute for Building Sciences (matching): H*Wind

2000-2002 $90 k NOAA Environmental Services Data and Information Program: Object-oriented data base implementation

2000-2001 $30k Friends of the National Hurricane Center, Research Support

2001-2002 $401 k Joint Hurricane Testbed: H*Wind development and testing at NHC

2001-2003, $250k NOAA High Performance Computing and Communications: H*Wind Web application

2001-2005 $300 k National Oceanographic Partnership Program (subcontract from U. Miami) H*Wind (co-PI)

2001-2005 $483 k State of Florida Office of Insurance Regulation (subcontract from FIU): Meteorological Component of State of Florida Hurricane Loss Model (co-PI)

2002-2003 $110 k NESDIS: H*Wind use of remotely sensed surface winds for input to HAZUS

2003 $65 k U. S. Army Corps of Engineers: Reconstruction of Hurricane Betsy wind fields for surge modeling

2003 $68 k U. S. Army Corps of Engineers: Reconstruction of Hurricanes Lili and Isidore wind fields for surge modeling

2005 $48 k U. S. Army Corps of Engineers MORPHOS: 2004 Hurricane wind field reconstructions

2006 $85 k U. S. Army Corps of Engineers Katrina Interagency Evaluation Team: Wind Analyses

2005-2006 $134 k Joint Hurricane Test Bed: Cd distribution and behavior in hurricanes

2005-2006, $106k NOAA High Performance Computing and Communications: Real-time hurricane monitoring aboard the NOAA aircraft

2006 $25 k U. S. Army Corps of Engineers Louisiana Coastal Risk Prediction: Gulf of Mexico Hurricanes

2006-2008 $159 k State of Florida Office of Insurance Regulation (subcontract from FIU) Risk model maintenance, submission, revision, commercial model development

2006-2007 $50 k State Farm: A Study of Landfalling Hurricanes of 2004 and 2005

2007 $76.5 k Joint Hurricane Test Bed: Cd dependence on water depth in extreme winds

2007 $20 k National Institute for Standards and Technology: Wind and Surge joint probability feasibility study for Tampa Bay Area

2008 $10 k U. S. Army Corps of Engineers: Texas Coastal Risk Prediction

2008-2009 $110 k U. S. Army Corps of Engineers: Wind field reconstruction Hurricanes Gustav and Ike

SERVICE ACTIVITIES

Reviewer for MWR, W&F, BAMS, GRL, JAS, JPO, WMO, NASA and NOAA proposals.

1989 National Research Council Natural Disaster team for Hurricane Hugo

1992 Chair, Research Committee of the Interdepartmental Hurricane Conference

1990-1992 ASCE Task Committee for Wind Damage Investigation

1992 Panel OFCM Workshop on wind measurement standards

1995-1996 Scientific Operations Officer for NOAA's Marine Olympic Weather Support Team in Savannah, Ga. for the 1996 Summer Olympic Games and team meteorologist for the U. S. Sailing Team at the 1991 Pan American Games.

1997-1998 Board of American Association for Wind Engineering

1996-1997 U. S. Weather Research Project Prospectus Development Teams for Hurricanes and Coastal Meteorology

1997-2005 HAZUS Wind Technical Committee

1998 Organized first HRD Retreat at the Kampong

1998 National Research Council: Review of the need for a large-scale test facility for research on the effects of extreme winds on structures.

1999 U.S. - Japan Task Committee on Wind Engineering, member of U.S. Delegation

2001-2003 U.S. Army Corps of Engineers Technical Review Panel on ADCIRC modeling

2002 Sea Grant Coastal Hazards Theme Team: Chair of Hurricanes and Coastal Storms sub theme committee

2004 AMS Tropical Meeting Panel Discussion Chair on Tropical Cyclone Data Sources

2004 Chair, HRD Data policy committee

2004 Session Chair at International Conference on Wind Engineering, Lubbock Texas

2005 Organizer and chair of Florida, Alabama, Puerto Rico NWS Science Officer Tropical Cyclone Workshop

2005-2006 Interagency Post-Katrina Performance Evaluation Task Force team member

2005-2006 Career Day presentations at Riviera Day School

2007 National Academy of Sciences Review of the Need for a Coastal Storm Impact Scale

SELECTED PRESENTATIONS

1999 U.S. - Japan Task Committee on Wind Hazards, Tsukuba Science City Japan: Hurricanes at Landfall

1999 International Conference on Wind Engineering, Copenhagen, Denmark, (also given at U. Munich): GPS sonde insights on boundary layer wind structure in hurricanes

2003 NOAA NWS-EMC Camp Springs MD: "Real-time Hurricane Surface Wind Analysis"

2004 26th AMS Conference on Hurricanes and Tropical Meteorology, Miami, FL: Uncertainty in Hurricane Winds: What do new measurements and simulations tell us about Hurricane Andrew?

2005 Tenth America's Conference on Wind Engineering, Baton Rouge, LA:

Uncertainty in Hurricane Winds (Invited plenary keynote)

Validation of the HRD Hurricane Wind Field Component Used in the State of Florida Hurricane Loss Projection Model

Hurricane Winds at Landfall: 2004

2006 U. South Alabama, NOAA HQ Silver Spring MD:

A new metric for hurricane intensity

2006 27th AMS Conference on Hurricanes and Tropical Meteorology, Monterey, CA:

Hurricane Katrina's wind field: synthesizing wind observations to construct an analysis of record

2007 At AOML (April), NHC (May), FSU (June):

Integrated Kinetic Energy: A new metric for tropical cyclone destructive potential

2007 Texas A&M (Sept.): Workshop on Texas Coastal Hurricane Risk (joint with Coastal and Ocean Engineering Department seminar)

Hurricane wind field characteristics for the Texas coast

2007 International Workshop on Wave Hindcasting and Forecasting, Oahu, HI (Nov. 11-16):

New findings on hurricane intensity, wind field extent, and surface drag coefficient behavior

2008 Annual Meeting of the American Meteorological Society, Tropical Meteorology Special Symposium (Jan 20-24):

Improved measures of hurricane destructive potential based on integrated kinetic energy

2008 State Farm Insurance, Bloomington Illinois, Executive Briefing: Uncertainty in Hurricane Wind As□ sessment

PATENTS

Predicting Tropical Cyclone Destructive Potential by Integrated Kinetic Energy According to the Powell/ Reinhold Scale (Application Pending, filed U.S. Patent and Trademark Office on 3-18-2008)