

Curriculum Vita
 Frank D. Marks, Jr.
 Research Meteorologist and Director
 NOAA/AOML Hurricane Research Division
 Miami, FL 33149
 305-361-4321
Frank.Marks@noaa.gov



Education:

Belknap College	Meteorology	B.S.	1973
Massachusetts Institute of Technology	Meteorology	M.S.	1975
Massachusetts Institute of Technology	Meteorology	Sc.D.	1981

Professional Experience:

Meteorologist	July 1975 to July 1976
Center for Experiment Design and Data Analysis NOAA/Environmental Data Service, Washington, DC	
Research Meteorologist	July 1980 to present
Director	February 2003 to present
Hurricane Research Division NOAA/Atlantic Oceanographic Meteorological Laboratory, Miami, FL	
Adjunct Professor	September 1993 to present
Department of Meteorology and Physical Oceanography Rosenstiel School for Marine and Atmospheric Sciences, University of Miami, Miami, FL	
Fellow	January 1997 to present
Cooperative Institute for Marine and Atmospheric Studies Rosenstiel School for Marine and Atmospheric Sciences, University of Miami, Miami, FL	
Senior Fellow	July 1997 to 2012
Joint Institute for Marine and Atmospheric Research University of Hawaii at Manoa, Honolulu, HI	

Accomplishments:

Specialized in radar remote sensing (ground-based, airborne, and spaceborne) of tropical cyclones and mesoscale convective systems to understand the storm kinematic and precipitation structure.

Field Program Experience:

1980-present	NOAA Hurricane Field Program (over 380 research missions in tropical cyclones) – field program director 1993-2001
1992-93	TOGA COARE (Solomon Islands)
1991	Convection and Precipitation Experiment (Florida)
1991	Tropical Experiment in Mexico (Acapulco, Mexico)
1987	Equatorial Mesoscale Experiment (Australia)
1986	Genesis of Atlantic Lows Experiment (North Carolina)
1985	Preliminary Regional Experiment for STORM-Central (Kansas)
1978-79	Winter Monsoon Experiment (Malaysia)
1974	GATE (Africa)

Honors and Awards:

2015	U.S. Department of Commerce Gold Medal for developing and implementing the high-resolution HWRF model (group award)
2014	AMS Banner I. Miller Award (with Fuqing Zhang, Yonghui Weng, and John Gamache)
2012	NOAA Administrators Award for outstanding management of the G-IV Tail Doppler Radar project (group award)
2011	2010 NOAA/OAR Outstanding Scientific Paper Award for Weather and Water
2011	AMS Verner E. Suomi Award
2010	NOAA Distinguished Career Award
2008	NOAA Research Employee of the Year
2007	NOAA Bronze Medal for Hurricane Research Division Performance during Hurricanes Rita and Katrina (group award)

- 2005 NOAA Administrator's Award for establishing and administering the Joint Hurricane Testbed (group award)
- 2005 OFCM Richard H. Hagemeyer Award at the 59th Interdepartmental Hurricane Conference
- 2005 USWRP Joint Hurricane Testbed Outstanding Contributor Award
- 2003 NOAA Diversity Council Spectrum Achievement Award for Managers
- 2001 NOAA TECH 2002 award for best wireless application for development of satellite-cell based WLAN for NOAA WP-3D aircraft
- 1997 US Department of Commerce Silver Medal for performance as the Research Mission Manager for the NOAA High Altitude Jet procurement
- 1992 US Department of Commerce Gold Medal for Hurricane Research Division's Performance in Hurricane Andrew (group award)
- 1989 Distinguished Authorship Award, National Oceanic and Atmospheric Administration, Environmental Research Laboratories

AMS Activities:

- 2013–2016 Councilor, American Meteorological Society
- 2000–present Fellow, American Meteorological Society
- 1984–1991 Committee on Radar Meteorology, American Meteorological Society (Chairman 1987–1991)
- 1980–present member, Greater Miami Chapter of the American Meteorological Society (secretary 1981, chairman 1982)
- 1973–present member, American Meteorological Society
- 1971–1973 student member, American Meteorological Society

Professional Activities:

- 2015–present NCAR EOL Airborne Phased Array Radar (APAR) Advisory Committee
- 2011–2012 NOAA Service Assessment Team for Hurricane Irene 2011, (Co-lead)
- 2010–2012 Review Team for NASA Earth Venture-1 Investigation: Hurricane and Severe Storm Sentinel (HS3)
- 2008–present Working Group for Tropical Cyclone Research (WG/TCR) for the Office of the Federal Coordinator for Meteorological Services and Supporting Research (OFCM), (Co-chairman)
- 2007–present NOAA Hurricane Forecast Improvement Project, (Lead)
- 2006 Guest Associate Editor, Special Issue on CAMEX, Journal of Atmospheric Science
- 2005–2007 Tropical Cyclone Joint Action Group (TC/JAG) for the Office of the Federal Coordinator for Meteorological Services and Supporting Research (OFCM), (Co-chairman)
- 2005–2014 NCAR EOL External Advisory Committee
- 2004 NOAA/National Weather Service Executive Leadership Seminar
- 2003–2012 NOAA G-IV tail Doppler radar procurement, (Research Mission Manager)
- 2001–2005 USWRP Joint Hurricane Testbed Steering Committee
- 1999–2008 NASA TRMM (Precipitation) Science Team
- 1999 Review Committee for NASA/GSFC Mesoscale Atmospheric Processes Branch
- 1998 UCAR Advanced Study Program (ASP) Summer Colloquium on Hurricanes at Landfall (co-organizer)
- 1997 USWRP Landfalling Hurricanes Workshop Organizing Team (Co-Chairman)
- 1996 USWRP Prospectus Development Team #5: Landfalling tropical cyclones, (Co-Chairman)
- 1996–2001 North American Atmospheric Observing System (NAOS), Test and Evaluation Working Group
- 1996 NSF Review panel for NCAR's Atmospheric Technology Division, (Chairman)
- 1995 Committee of Visitors, Review of the NSF Division of Atmospheric Sciences' Lower Atmospheric Research Section
- 1993–1997 NOAA mid-size jet procurement, (Research Mission Manager)
- 1992–1994 Observing Facility Advisory Panel, NCAR/ATD (Chairman 1994)

Publications (Books and Refereed Journals)

1. Marks, F. D., J. A. Zhang, P. Dodge, and C. Sandin, 2017: The atmospheric boundary wind layer structure at the landfall of Hurricane Fran (1996) from WSR-88D radar observations. *Mon. Wea. Rev.*, (submitted).
2. Saiprasanth, B., R. Nadimpalli, K. K. Osuri, S. Subramanian, S. Gopalakrishnan, F. D. Marks, U. C. Mohanty, and D. Niyogi, 2017: An 'environmental to vortex' scale synthesis of rapid intensity changes in landfalling tropical cyclones over the Bay of Bengal. *Nature Scientific Reports*, (submitted).
3. Tyner, B., P. Zhu, J. A. Zhang, S. Gopalakrishnan, F. D. Marks, and V. Tallapragada, 2017: Sensitivity of tropical cyclone secondary eyewall formation in the HWRF system to snow fall speed. *J. Geophys. Res.*, (submitted).

4. Zhang, J. A., F. D. Marks, J. A. Sippel, X. Zhang, G. S. Gopalakrishnan, R. F. Rogers, and Z. Zhang, 2017: Improving hurricane model physics using aircraft observations: horizontal diffusion parameterization in HWRF. *Wea. Forecast.* (submitted).
5. Soukup, G. A., and F. D. Marks, 2017: Evaluation of Hurricane Windspeed Analyses in a Simulation of Hurricane Earl (2010) Using Low Order Wavenumbers. *Mon. Wea. Rev.*, (revised).
6. Alaka, G. J., X. Zhang, S. G. Gopalakrishnan, S. B. Goldenberg, and F. D. Marks, 2017: Performance of Atlantic basin track forecasts from the 2013 basin-scale HWRF. *Weather and Forecasting*, (accepted).
7. Kalina, E., S. Matrosov, J. Cione, F. Marks, J. Vivekanandan, R. Black, J. Hubbert, M. Bell, D. Kingsmill, and A. White, 2017: The ice water paths of small and large ice species in Hurricanes Arthur (2014) and Irene (2011). *J. Appl. Meteor. Climatol.*, **56**, (doi: <http://dx.doi.org/10.1175/JAMC-D-16-0300.1>).
8. Marks, F. D., 2016: Advancing the understanding and prediction of tropical cyclones using aircraft observations, *Advanced Numerical Modeling and Data Assimilation Techniques for Tropical Cyclone Prediction*. Ed: S. Gopalakrishnan and U. C. Mohanty, Springer Netherlands (doi: <http://dx.doi.org/10.1007/978-94-024-0896-6>)
9. Kellner, O., D. Niyogi, and F. D. Marks, 2016: Land-falling Tropical System Rainfall Contribution to the Hydroclimate of the Eastern U.S. Corn Belt 1981–2012, *Wea. Clim. Extremes*, 54–67. doi: <http://dx.doi.org/10.1016/j.wace.2016.06.001>.
10. Mohanty, U. C., K. K. Osuri, V. Tallapragada, F. D. Marks, S. Pattanayak, M. Mohapatra, S. G. Gopalakrishnan, D. Niyogi, 2016: A Great Escape from the Bay of Bengal “Super Sapphire-Phailin” Tropical Cyclone: A Case of Improved Weather Forecast and Societal Response for Disaster Mitigation. *Earth Interact.*, **19**, 1–11. doi: <http://dx.doi.org/10.1175/EI-D-14-0032.1>.
11. Zhu, P., Z. Zhu, S. Gopalakrishnan, R. Black, F. D. Marks, V. Tallapragada, J. A. Zhang, X. Zhang, and C. Gao, 2016: Impact of subgrid-scale processes on eyewall replacement cycle of tropical cyclones in HWRF system, *Geophys. Res. Lett.*, **42**, 10,027–10,036, doi: [10.1002/2015GL066436](http://dx.doi.org/10.1002/2015GL066436).
12. Zhang, J. A., and F. D. Marks, 2015: Sensitivity of tropical cyclone intensity change and structure to horizontal diffusion in idealized three-dimensional numerical simulations. *Mon. Wea. Rev.*, **143**, 3981–3995. doi: <http://dx.doi.org/10.1175/MWR-D-14-00341.1>.
13. Goldenberg, S. B., S. G. Gopalakrishnan, V. Tallapragada, T. Quirino, F. D. Marks, S. Trahan, X. Zhang, and R. Atlas, 2015: The 2012 Triply Nested, High-Resolution Operational Version of the Hurricane Weather Research and Forecasting Model (HWRF): Track and Intensity Forecast Verifications. *Wea. Forecasting*, **30**, 710–729. doi: <http://dx.doi.org/10.1175/WAF-D-14-00098.1>
14. Halliwell, Jr., G. R., S. Gopalakrishnan, F. Marks, and D. Willey, 2015: Idealized Study of Ocean Impacts on Tropical Cyclone Intensity Forecasts. *Mon. Wea. Rev.*, **143**, 1142–1165, doi: <http://dx.doi.org/10.1175/MWR-D-14-00022.1>
15. Marks, F. D. Hurricanes: Observations. In *Encyclopedia of Atmospheric Sciences* (2nd edition), G.R. North, J. Pyle, and F. Zhang (eds.). Academic Press, Volume 6, 35–56, 2014.
16. Ming, J., J. A. Zhang, R. F. Rogers, F. D. Marks, Y. Wang, and N. Cai, 2014: Multiplatform observations of boundary layer structure in the outer rainbands of landfalling typhoons, *J. Geophys. Res.* Atmos., **119**, 7799–7814, doi: <http://dx.doi.org/10.1002/2014JD021637>.
17. Marks, F. D., 2014: Advancing Tropical Cyclone Forecasts Using Aircraft Observations, *Monitoring and Prediction of Tropical Cyclones in the Indian Ocean and Climate Change*. Ed. U. C. Mohanty, M. Mohapatra, O. P. Singh, B. K. Bandyopadhyay, and L. S. Rathore, Springer, 169–191. doi: http://dx.doi.org/10.1007/978-94-007-7720-0_15.
18. Zhang, J. A., M. T. Montgomery, F. D. Marks, and R. K. Smith, 2014: Comments on "Symmetric and Asymmetric Structures of Hurricane Boundary Layer in Coupled Atmosphere-Wave-Ocean Models and Observations". *J. Atmos. Sci.*, **71**, 2782–2785. doi: <http://dx.doi.org/10.1175/JAS-D-13-0207.1>.
19. Zhang, J. A., R. F. Rogers, P. D. Reasor, E. W. Uhlhorn, F. D. Marks, 2013: Asymmetric Hurricane Boundary Layer Structure from Dropsonde Composites in Relation to the Environmental Vertical Wind Shear. *Mon. Wea. Rev.*, **141**, 3968–3984. doi: <http://dx.doi.org/10.1175/MWR-D-12-00335.1>
20. Vukicevic, T., A. Aksoy, P. Reasor, S. D. Aberson, K. J. Sellwood, and F. Marks, 2013: Joint impact of forecast tendency and state error biases in Ensemble Kalman Filter data assimilation of inner-core tropical cyclone observations. *Mon. Wea. Rev.*, **141**, 2992–3006. doi: <http://dx.doi.org/10.1175/MWR-D-12-00211.1>
21. Rogers, R., S. Aberson, A. Aksoy, B. Annane, M. Black, J. Cione, N. Dorst, J. Dunion, J. Gamache, S. Goldenberg, S. Gopalakrishnan, J. Kaplan, B. Klotz, S. Lorsolo, F. Marks, S. Murillo, M. Powell, P. Reasor, K. Sellwood, E. Uhlhorn, T. Vukicevic, J. Zhang, and X. Zhang, 2013: NOAA's Hurricane Intensity Forecasting Experiment (IFEX): A Progress Report, *Bull. Amer. Meteor. Soc.*, **94**, 859–882. doi: <http://dx.doi.org/10.1175/BAMS-D-12-00089.1>.
22. Gall, R., J. Franklin, F. D. Marks, E. N. Rappaport, F. Toepfer, 2013: The Hurricane Forecast Improvement Project. *Bull. Amer. Meteor. Soc.*, **94**, 329–343 doi: <http://dx.doi.org/10.1175/BAMS-D-12-00071.1>.
23. Zhang, J., S. Gopalakrishnan, F. Marks, R. Rogers, V. Tallapragada, 2013: A developmental framework for improving hurricane model physical parameterizations using aircraft observations. *Trop. Cyclone*

- Res. and Rev., 1, 419–429, doi: <http://dx.doi.org/10.6057/2012TCRR04.01>.
24. Gopalakrishnan, S., F. D. Marks, J. Zhang, X. Zhang, J.-W. Bao, and V. Tallapragada, 2013: A study of the impact of vertical diffusion on the structure and intensity of tropical cyclones using the high-resolution HRRF system. *J. Atmos. Sci.*, **70**, 524–541, doi: <http://dx.doi.org/10.1175/JAS-D-11-0340.1>
 25. Marks, F. D., W. Browning, V. Brown, T. Adams–Fuller, S. Jasko, M. Allen, S. Wink, A. Fish, J. Gordon, A. Haynes, J. Brost, W. Hooke, R. Tanabe, S. Lindsey, M. Clay, J. Kelley, S. Winkelman, and R. Dittman, 2012: Service Assessment: Hurricane Irene, August 21–30, 2011, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service Silver Spring, MD, 117 p (<http://www.nws.noaa.gov/om/assessments/pdfs/Irene2012.pdf>).
 26. Bao, J.-W., S. G. Gopalakrishnan, S. A. Michelson, F. D. Marks, M. T. Montgomery, 2012: Impact of physics representations in the HRRF model on simulated hurricane structure and wind–pressure relationships. *Mon. Wea. Rev.*, **140**, 3278–3299, doi: <http://dx.doi.org/10.1175/MWR-D-11-00332.1>.
 27. Gopalakrishnan, S. G., S. Goldenberg, T. Quirino, F. D. Marks, X. Zhang, K.-S. Yeh, R. Atlas, and V. Tallapragada, 2012: Towards improving high-resolution numerical hurricane forecasting: Influence of model horizontal grid resolution, initialization, and physics, *Wea. Forecast.*, **27**, 647–666, doi: <http://dx.doi.org/10.1175/WAF-D-11-00055.1>.
 28. Rogers, R., S. Lorsolo, P. Reasor, J. Gamache, and F. D. Marks, 2012: Multiscale analysis of mature tropical cyclone structure from airborne Doppler composites, *Mon. Wea. Rev.*, **140**, 77–99. doi: <http://dx.doi.org/10.1175/MWR-D-10-05075.1>
 29. Laureano, M., D. Niyogi, M. E. Baldwin, S. Gopalakrishnan, F. D. Marks, X. Zhang, V. Tallapragada, 2011: An HRRF-based ensemble assessment of the land surface feedback on the post – landfall intensification of Tropical Storm Fay (2008). *Natural Hazards*, **59**, doi: <http://dx.doi.org/10.1007/s11069-011-9841-5>.
 30. Shay, L. K., B. Jaimes, J. K. Brewster, P. Meyers, E. C. McCaskill, E. Uhlhorn, F. Marks, G. R. Halliwell Jr., O. M. Smedstad, and P. Hogan (2011), Airborne ocean surveys of the Loop Current complex from NOAA WP-3D in support of the Deepwater Horizon oil spill, in *Monitoring and Modeling the Deepwater Horizon Oil Spill: A Record-Breaking Enterprise*, Geophys. Monogr. Ser., **195**, edited by Y. Liu et al., 131–151, AGU, Washington, D. C., doi: <http://dx.doi.org/10.1029/2011GM001101>.
 31. Zhang, J., R. Rogers, D. Nolan, F. D. Marks, 2011: On the characteristic height scales of the hurricane boundary layer. *Mon. Wea. Rev.*, **139**, 2523–2539. doi: <http://dx.doi.org/10.1175/MWR-D-10-05017.1>
 32. Gopalakrishnan, S. G., F. D. Marks, X. Zhang, J.-W. Bao, K.-S. Yeh, and R. Atlas, 2011: The experimental HRRF system: A study on the influence of horizontal resolution on the structure and intensity changes in tropical cyclones using an idealized framework. *Mon. Wea. Rev.*, **139**, 1762–1784. doi: <http://dx.doi.org/10.1175/2010MWR3535.1>
 33. Zhang, F., Y. Weng, J. F. Gamache, and F. D. Marks, 2011: Performance of convection-permitting hurricane initialization and prediction during 2008–2010 with ensemble data assimilation of inner-core airborne Doppler radar observations, *Geophys. Res. Lett.*, **38**, L15810, doi: <http://dx.doi.org/10.1029/2011GL048469>.
 34. Yeh, K.-S., X. Zhang, S. G. Gopalakrishnan, S. Aberson, R. Rogers, F. D. Marks, and R. Atlas, 2011: Performance of the experimental HRRF in the 2008 hurricane season. *Natural Hazards*, **56**, doi: <http://dx.doi.org/10.1007/s11069-011-9787-7>.
 35. Zhang, J., P. Zhu, F. J. Masters, R. F. Rogers, F. D. Marks, 2011: On momentum transport and dissipative heating during hurricane landfalls, *J. Atmos. Sci.*, 1397–1404. doi: <http://dx.doi.org/10.1175/JAS-D-10-05018.1>
 36. Zhang, J., F. D. Marks, M. Montgomery, and S. Lorsolo, 2011: An estimation of turbulent characteristics in the low-level region of intense Hurricanes Allen (1980) and Hugo (1989), *Mon. Wea. Rev.*, **139**, 1447–1462. doi: <http://dx.doi.org/10.1175/2010MWR3435.1>
 37. Zhang, X., T. S. Quirino, K.-S. Yeh, S. G. Gopalakrishnan, F. D. Marks, S. B. Goldenberg, and S. Aberson, 2011: HRRFx: Improving Hurricane Forecasts with High-Resolution Modeling, *Comput. Sci. Eng.* **13**, 13–21, doi: <http://dx.doi.org/10.1109/MCSE.2010.121>.
 38. Murillo, S., W.-C. Lee, M. M. Bell, F. D. Marks, P. P. Dodge, and G. Barnes, 2011: Intercomparison of GBVTD-retrieved circulation centers and structures of Hurricane Danny (1997) for two coastal WSR-88Ds. *Mon. Wea. Rev.*, **139**, 153–174. doi: <http://dx.doi.org/10.1175/2010MWR3036.1>
 39. Lorsolo, S., J. Zhang, F. D. Marks, J. F. Gamache, 2010: Estimation and Mapping of Hurricane Turbulent Energy Using Airborne Doppler Measurements, *Mon. Wea. Rev.*, **138**, 3656–3670. doi: <http://dx.doi.org/10.1175/2010MWR3183.1>
 40. Rogers, R.F., F. D. Marks, and T. Marchok, 2009: Tropical Cyclone Rainfall. *Encyclopedia of Hydrological Sciences*. Malcolm G. Anderson (Ed.), Chichester, UK: John Wiley & Sons, Ltd. doi: <http://dx.doi.org/10.1002/0470848944.hsa030>.

41. Wright, C. W., E. J. Walsh, W. B. Krabill, W. A. Shaffer, S. R. Baig, M. Peng, L. J. Pietrafesa, A. W. Garcia, F. D. Marks, P. G. Black, J. Sonntag, B. D. Beckley, 2009: Storm surge measurement with an airborne scanning radar altimeter. *J. Phys. Ocean*, **26**, 2200–2215. doi: <http://dx.doi.org/10.1175/2009JTECHO627.1>
42. Fierro, A., R. Rogers, F. D. Marks, and D. Nolan, 2009: Impact of horizontal grid spacing on simulated tropical cyclone microphysical and kinematic structure. *Mon. Wea. Rev.*, **137**, 3717–3743. doi: <http://dx.doi.org/10.1175/2009MWR2946.1>
43. Marks, F. D., P. G. Black, M. T. Montgomery, and R. W. Burpee 2008: Structure of the eye and eyewall of Hurricane Hugo (1989). *Mon. Wea. Rev.*, **136**, 1237–1259. doi: <http://dx.doi.org/10.1175/2007MWR2073.1>
44. Loruso, S., J. L. Schroeder, P. P. Dodge, and F. D. Marks, 2008: An Observational Study of Hurricane Boundary Layer Small-Scale Coherent Structures. *Mon. Wea. Rev.*, **136**, 2871–2893. doi: <http://dx.doi.org/10.1175/2008MWR2273.1>
45. Willoughby, H. E., E. Rappaport, and F. D. Marks, 2007: Hurricane Forecasting: The State of the Art, *ASCE Nat. Haz. Rev.*, **8**, 45–49. doi: [http://dx.doi.org/10.1061/\(ASCE\)1527-6988\(2007\)8:3\(45\)](http://dx.doi.org/10.1061/(ASCE)1527-6988(2007)8:3(45))
46. Lonfat, M., R. Rogers, T. Marchok, and F. D. Marks, 2007: A Parametric Model for Predicting Hurricane Rainfall. *Mon. Wea. Rev.*, **135**, 3086–3097. doi: <http://dx.doi.org/10.1175/MWR3433.1>
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48. S. S. Chen, J. A. Knaff, and F. D. Marks, 2006: Effects of environmental vertical wind shear and storm motion on tropical cyclone rainfall asymmetries deduced from TRMM. *Mon. Wea. Rev.*, **134**, 3190–3208. doi: <http://dx.doi.org/10.1175/MWR3245.1>
49. Esteban-Fernandez, D., J. R. Carswell, S. Frasier, P. S. Chang, P. G. Black, F. D. Marks, 2006: Dual-polarized C- and Ku-band ocean backscatter response to hurricane-force winds. *J. Geophys. Res.*, **111**, C08013. doi: <http://dx.doi.org/10.1029/2005JC003048>.
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59. Harasti, P. R., C. J. McAdie, P. P. Dodge, W.-C. Lee, J. Tuttle, S. T. Murillo, and F. D. Marks, 2004: Real-time implementation of single-Doppler radar analysis methods for tropical cyclones: Algorithm improvements and use with WSR-88D display data. *Weather Forecasting*, **19**, 219–239. doi: [http://dx.doi.org/10.1175/1520-0434\(2004\)019<0219:RIOSRA>2.0.CO;2](http://dx.doi.org/10.1175/1520-0434(2004)019<0219:RIOSRA>2.0.CO;2)
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