

John A. Knaff, PhD

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EXECUTIVE SUMMARY

Skilled leader of scientific research and satellite algorithm developer with 24 years of experience in the areas of satellite remote sensing and tropical meteorology. A recognized hurricane expert who is responsible for designing research activities, developing satellite-based algorithms, and statistical models that improve the utility of satellite-based observations for monitoring and forecasting extreme weather events, particularly hurricanes.

EDUCATION

- Ph.D.** Colorado State University, Atmospheric Science, 1997
Dissertation: "Progress towards seasonal prediction in the tropics"
- M.S.** Colorado State University, Atmospheric Science, 1992
Thesis: "Evidence of a stratospheric QBO modulation of tropical convection"
- B.S.** Texas A&M University, Meteorology, 1989

EXPERIENCE

Physical Scientist, NOAA/NESDIS/STAR/Regional and Mesoscale Meteorology Branch, Fort Collins, CO, December 2006- present

My primary role in this position was to improve the use of remotely sensed data to monitor and forecast mesoscale weather phenomenon, specifically hurricanes by writing proposals and working with Cooperative Institute researchers. This work included developing and leading efforts to create and improve satellite algorithms designed to help end users better fulfill their missions, and working with international and interagency partners to improve hurricane monitoring and forecasting. These activities were funded by GOES and JPSS Proving Ground, GOES Risk Reduction, GOES I/M Product Insurance Plan (GIMPAP), and the Joint Hurricane Testbed.

Research Scientist II, CIRA, Colorado State University, July 2004 - November 2006

My primary role in this position was to support CIRAs mission to improve the utilization of satellite data for improving monitoring and forecasting weather. In

this position, I worked closely with NOAA scientists to transition satellite algorithms and forecast models to operations and document scientific research findings. I also wrote proposals and managed research funding. I also supervised several CIRA scientists. This was a 12-month soft money position.

Research Scientist I, CIRA, Colorado State University, July 2002

My primary role in this position was to support CIRAs mission to improve the utilization of satellite data for improving monitoring and forecasting weather. I worked on statistical tropical cyclone models, satellite algorithms, and transitioned those techniques to operations at NOAA and the Department of Defense. This was a 12-month soft money position.

Research Associate, CIRA, Colorado State University, May 1999 - July 2002

My primary role in this position was to support CIRAs mission to improve the utilization of satellite data for improving monitoring and forecasting weather. My largest task was developing software to run a hurricane intensity and wind structure algorithm in real-time for testing at the National Hurricane Center.

Post-Doctoral Fellow, CIRA, Colorado State University, July 1997 - April 1999

My primary role was to investigate the utility of super rapid scan (i.e., one-minute) satellite imagery for improving tropical cyclone monitoring and forecasting.

Post-Doctoral Research Associate, Colorado State University, April 1997 - July 1997

Wrote several papers documenting my PhD work.

Graduate Research Assistant, Colorado State University, July 1989- April 1997

(see thesis and dissertation in the education section).

SCIENTIFIC OUTREACH ACTIVITIES

As a RAMMB physical scientist:

- **Member, JPSS/GOES-R Risk Reduction Proving Ground Tropical Cyclone Initiative**, Member 2018 – Present.
- **Associate Editor *Weather and Forecasting***, 2018-present
- **Associate Editor *Monthly Weather Review***, 2016-present
- **Co-Advisor CSU PhD Candidate** (Dr. Louis Rivoire), 2015-2020
- **WMO co-topic-lead, Topic 9: TC Analysis and Remote Sensing Tools (2018)**. The purpose of this work is to produce and present this topic at the International Workshop on Tropical Cyclones (IWTC) – 9
- **Member of the Temporal Experiment for Storms and Tropical Systems Technology – Demonstration Science Team (2018- present)**. Provide how

data on this experimental satellite can be used to uniquely observe tropical cyclones and tropical convection.

- **NOAA/STAR Employee Advisory Committee member (2017-present).** I meet monthly with other STAR representatives to make STAR a better place to work, clarify policy and advocate on employee issues.
- **Hurricane Forecast Improvement Program (HFIP), Satellite DA/ vortex initialization Tiger team (2014-2016).** The goal of this group was to improve the use of satellite based data in Hurricane Models
- **WMO lead (2014), Special Focus Session SF 4a Objective structure analysis, IWTC-8.** The goals were to document (written report) present how satellite data have been used to estimate tropical cyclone surface wind distributions; progress in the last four years.
- **WMO co-lead (2014), Topic 2.7 Advances in intensity guidance, IWTC-8.** The goal of this activity was to produce a report and orally present progress in improving tropical cyclone intensity forecasts in the last four years
- **Hurricane Forecast Improvement Program (HFIP) Use of Satellite data for TC initialization tiger team, co-lead (2013-2014).** The goals of this team was to interact with data assimilation scientist to improve hurricane initialization in numerical weather prediction models.
- **Risk Prediction Initiative 2.0, reviewer (2012).** This was a scientific review of a commercial hurricane risk model used to routinely estimated damages caused by hurricane events.
- **Hurricane Forecast Improvement Program (HFIP) Observations Team co-lead (2010-2013).** The purpose of this team was to familiarize users with the variety of observations available for hurricane research and model development.
- **Hurricane Forecast Improvement Program (HFIP) Post Processing / Applications Development Team member (2008-2014).** The purpose of this group was to develop model and satellite-based hurricane applications. My role centered around synthetic satellite image generation.
- **WMO Focal Point for tropical cyclone structure forecasting 2007-present.** In this position my expertise is used to answer questions about current capabilities and make suggestions as to what WMO should support in the future.

As a CIRA Research Scientist and Research Associate:

- **WMO Keynote topic co-lead, “wind-pressure relationships and 1-minute/10-minute wind conversions”, IWTC-7.** The goal of this activity was to produce a written report and give a keynote presentation kicking off the IWTC-7. One of the themes of this IWTC was unifying how central tropical cyclone pressure and the surface wind field are estimated.
- **Risk Management Systems, Inc, Expert Elicitation participant, 2006, 2007.** These meetings were designed to provide a consensus answer to the

specific question, how active will Atlantic hurricane seasons be in the next five years.

- **WMO Chair, sub-topic for section 1.5 tropical cyclone structure prediction, 6th IWTC - 6 2006.** The purpose of this group was to provide a written report and orally present progress in this topic in the past four years.
- **WMO Committee Member, sub-topic 1.1 Environmental Controls on Tropical Cyclone Structure, IWTC - 5, 2002.** I was a member of this team providing written input to the topic rapporteur about progress in the topic of vertical wind shear and tropical cyclone intensity and structure change.

As a student and graduate research assistant:

- **Student Representative, Department of Atmos. Science, 1991, 1995-1996.** Attended faculty meetings and represent student opinions and needs.

SELECTED AWARDS / HONORS

- **2020, AMS Editor's Award** for providing multiple rigorous, timely, and constructive reviews across three AMS journals, and also for contributing consistently excellent reviews over a period of many years.
- **2019, AMS editor reviewer appreciation award**, 13 reviews
- **2018, AMS editor reviewer appreciation award**, 12 reviews
- **2016, Best STAR Paper** on "An objective satellite-based tropical cyclone size climatology", which appeared in the *Journal of Climate*.
- **2012, CO-LABS Awards for High Impact Research (team member)** for creating advanced software that allows them to make direct comparisons between satellite observations and model forecasts to give a complete picture of tropical storms and their environments.
- **2012 Department of Commerce Bronze Medal** for providing skillful operational hurricane intensity models as demonstrated by the NHC forecast verifications for the 2009 and 2010 seasons.
- **2010 Department of Commerce Bronze Medal** for developing, implementing and conducting outreach for the new National Hurricane Center Tropical Cyclone Surface Wind Speed Probability products – along with M. DeMaria, A. Krautkramer, C. Lauer, C. Sisko, R. Knabb, C. Junkins, T. Schott, M. Mainelli, and E. Rappaport.
- **2008 Department of Commerce Bronze Medal** for the development and operational implementation of the Tropical Cyclone Formation product that quantitatively predicts storm formation probability along with Mark DeMaria, Antonio Irving, Nancy Merckle.
- **2004 NOAA David Johnson Award** for basic research for improving the understanding of tropical phenomenon and predicting tropical cyclone intensity, accompanied by exemplary transfer of the results into operational products.

- **Cooperative Institute for Research in the Atmosphere, Research Initiative Award** for innovative research and algorithm development using GOES rapid scan imagery, GOES sounder data and AMSU sensor data, 2000-2001.
- **NASA Graduate Student Fellowship in Global Change Research** (September 1992 to August 1995).

PROFESSIONAL SOCIETIES

1988-Present, American Meteorological Society

1993-Present, American Geophysical Union

2018-Present, Royal Meteorology Society

INVITED PRESENTATIONS

2019 (June) *Predicting rapid intensity changes in TCs: Operational tools, updates and new initiatives*, June 19, 2019, NRL, Monterey, CA

2019 (February) *CIRA/RAMMB Satellite and Forecast Tools, Products and Updates*, PACCOM Tropical Cyclone Conference, Feb., 12, 2019, Pearl Harbor, HI

2018 (December) *Next Generation Meteorological Satellite Systems: GOES-16/17*, International Workshop on Tropical Cyclones., Dec. 5, 2018, Honolulu, HI

2017 (February) *CIRA ATCF updates for JTWC*. Camp Smith, Feb 14, 2017, Camp Smith/JTWC

2016 (June) *Toward consensus estimates of tropical cyclone wind radii, progress at JTWC*, June 22, 2016, Cal Tech.

2014 (October) *ATCF: Lessons learned on TC consensus forecasting, International Cooperative for Aerosol Prediction (ICAP)*, Oct 22, 2014

2011 (September) *New Tropical Cyclone Intensity Forecast Tools for the Western North Pacific*, Joint Typhoon Warning Center. September 14, 2011.

2011 (September) *Overview of CIRA and NESDIS Global TC Services*, WMO Southern Hemisphere TC Workshop, Melbourne, Australia (via remote), 14 September 2011.

2010 (November), *Tropical cyclone surface wind structure and wind-pressure relationships. Keynote #1*, WMO International Workshop on Tropical Cyclones – VII, La Reunion, France, 15-20 November

2009 (May), National Climatic Data Center, International Best Track Archive for Climate Stewardship Workshop, 5-7 May 2009

2007 (October), National Hurricane Center, “CIRA/RAMMB Tropical Cyclone Forecast Tools: Planned Operational Transition and New Initiatives”, Miami, FL

2006 (October), Risk Management Solutions, Expert Elicitation, *Eyewall Symposium*, “Real-Time Forecasting of the Wind Structure: Current Capabilities and Challenges” New York, New York

2006 (December), WMO 6th International Workshop on Tropical Cyclones, “Topic 1.5: Operational guidance and skill in forecasting structure change”, San Jose, Costa Rica

2003 (August), Naval Postgraduate School, “Research to Better Diagnose and Predict Tropical Cyclone Structure and Intensity Change”, Monterey, CA

2000 (April), Debate: “Is There Skill in Forecasting El Nino and La Nina Events?”, Joint with the 24th Conference on Hurricanes and Tropical Meteorology and the 10th Conference on Interaction of the Sea and Atmosphere.

Debate Moderator: David B. Enfield, NOAA/AOML, Miami, FL

Skillful Forecasts Case: Robert E. Livezey, NOAA/NWS, Washington, DC

No-Skill in Forecasts Case: John Knaff, CIRA, Colorado State Univ., Fort Collins, CO

REFEREED PUBLICATIONS

Summary:

109 refereed publications that were referenced 5311 times

33 first author publications

h-index = 41 (i.e., at least 41 publications have 41 citations)

Submitted:

Chavas, D. R., and J. A. Knaff, 2021: A simple model for predicting the hurricane radius of maximum wind from outer size. **Wea. Forecasting.**

Knaff, J. A., and C. J. Slocum, 2021: An Automated Method to Analyze Tropical Cyclone Surface Winds from Real-time Aircraft Reconnaissance Data. *Wea. Forecasting.*

Accepted:

Sampson, C. R., E. R. Serra, J. A. Knaff, J. A., and J. H. Cossuth, 2021: Evaluation of global wave probabilities consistent with official forecasts. *Wea. Forecasting*, (published online ahead of print 2021).

<https://journals.ametsoc.org/view/journals/wefo/aop/WAF-D-21-0037.1/WAF-D-21-0037.1.xml>

Published:

Domingues, R., G. J. Goni, J. A. Knaff, I-I Lin, and F. Bringas, 2021: Tropical cyclone heat potential [in “State of the Climate in 2020”]. *Bull. Amer.*

- Meteor. Soc., 102 (8), S252–S255, <https://doi.org/10.1175/BAMS-D-21-0080.1>.
- Knaff, J.A, C. R. Sampson, M. Kucas, C. J. Slocum, M. J. Brennan, T. Meissner, L. Ricciardulli, A. Mouche, N. Reul, M. Morris, G. Chirokova, and P. Caroff, 2020: A practical guide to estimating tropical cyclone surface winds: History, current status, emerging technologies, and a look to the future. *Tropical Cyclone Research and Review*, **10**(3), 125-150, <https://doi.org/10.1016/j.tcr.2021.09.002>
- Pun, lam-Fei, J. A. Knaff, and C. R. Sampson, 2021: Uncertainty of tropical cyclone wind radii on sea surface temperature cooling. *Geophys. Res. Atmos.*, 126 (14), e2021JD034857. <https://doi.org/10.1029/2021JD034857>.
- Rivoire, L., T. Birner, J. A. Knaff, and N. D. Tourville, 2020: Quantifying the radiative impact of clouds on tropopause layer cooling in tropical cyclones. *J. Climate*, **33**, 6361-6376, doi:10.1175/JCLI-D-19-0813.1.
- Combot, C., A. Mouche, J. A. Knaff, Y. Zhao, Y. Zhao, L. Vinour, Y. Quilfen, and B. Chapron, 2020: Extensive high-resolution Synthetic Aperture Radar (SAR) data analysis of tropical cyclones: Comparisons with SFMR flights and best track. *Mon. Wea. Rev.*, **148**, 4545–4563, <https://doi.org/10.1175/MWR-D-20-0005.1>.
- Domingues, R., G. J. Goni, J. A. Knaff, I-I Lin, and F. Bringas, 2020: [The Tropics] Tropical Cyclone Heat Potential [in NOAA "State of the Climate in 2019"], *Bull. Amer. Meteor. Soc.*, **101**, S227-S229, doi: 10.1175/BAMS-D-20-0077.1
- Knaff, J.A., C.R. Sampson, and B.R. Strahl, 2020: A tropical cyclone rapid intensification prediction aid for the Joint Typhoon Warning Center's areas of responsibility. *Wea. Forecasting*, **35**, 1173 - 1185, DOI:10.1175/WAF-D-19-0228.1
- Neetu, S., M. Lengaigne, J. Vialard, M. Mangeas, C. E. Menkes, I. Suresh, J. Leloup, and J. A. Knaff, 2020: Quantifying the Benefits of Nonlinear Methods for Global Statistical Hindcasts of Tropical Cyclones Intensity. *Wea. Forecasting*, **35**(3), 807–820, <https://doi.org/10.1175/WAF-D-19-0163.1>.
- Courtney, J. B., S. Langlade, C. R. Sampson, J. A. Knaff, T. Birchard, S. Barlow, S.D. Kotal, T. Kriat, W. Lee, R. Pasch, and U. Shimada, 2019: Operational Perspectives on Tropical Cyclone Intensity Change Part 2: Forecasts by Operational Agencies. *Tropical Cyclone Research and Review*, **8**, 226-239. doi: 10.6057/2019TCRR04.03.
- Courtney, J. B., S. Langlade, C. R. Sampson, J. A. Knaff, T. Birchard, S. Barlow, S.D. Kotal, T. Kriat, W. Lee, R. Pasch, and U. Shimada 2019: Operational perspectives on tropical cyclone intensity change part 1: Recent advances in intensity guidance. *Tropical Cyclone Research and Review*, **8**, 123-133. DOI: 10.6057/2019TCRR03.02
- Bourassa, M. A., T. Meissner, I. Cerovecki, P. S. Chang, X. Dong, G. DeChiara, C/ Donlon, D. S. Dukhovskoy, J. Elya, A. Fore, M. R. Fewings, R. C. Foster, S. T. Gille, B.K. Haus, S.Hristova-Veleva, H. M. Holbach, Z.

- Jelenak, J. A. Knaff, S. A. Kranz, A. Manaster, M. Mazloff, C. Mears, A. Mouche, M. Portabella, N. Reul, L. Ricciardulli, E. Rodriguez, C. Sampson, D. Solis, A. Stoffelen, M. R. Stukel, B. Stiles, D. Weissman, and F. Wentz, 2019: Remotely Sensed Winds and Wind Stresses for Marine Forecasting and Ocean Modeling. *Frontiers in Marine Science*, **6**(443), <https://doi.org/10.3389/fmars.2019.00443>.
- Domingues R., A. Kuwano-Yoshida, P. Chardon-Maldonado, R.E. Todd, G. Halliwell, H.-S. Kim, I.-I. Lin, K. Sato, T. Narazaki, L.K. Shay, T. Miles, S. Glenn, J.A. Zhang, S.R. Jayne, L. Centurioni, M. Le Hénaff, G.R. Foltz, F. Bringas, M.M. Ali, S.F. DiMarco, S. Hosoda, T. Fukuoka, B. LaCour, A. Mehra, E.R. Sanabia, J.R. Gyakum, J. Dong, J.A. Knaff, and G. Goni, 2019: Ocean observations in support of studies and forecasts of tropical and extratropical cyclones. *Front. Mar., Sci.* **6**(446), doi: 10.3389/fmars.2019.00446.
- Goni, G. J., J. A. Knaff, and I - I. Lin, 2019: [The Tropics] Tropical Cyclone Heat Content [in NOAA "State of the Climate in 2018"], *Bull. Amer. Meteor. Soc.*, **100**(9), S133-S135. DOI: 10.1175/2019BAMSStateoftheClimate.1
- Mouche, A., B. Chapron, J. A. Knaff, Y. Zhao, B. Zhang, and C. Combot, 2019: Copolarized and cross-polarized SAR measurements for high-resolution description of major hurricane wind structures: Application to Irma category 5 hurricane. *J. Geophys. Res. Oceans*, **124**(6), 3905-3922, <https://doi.org/10.1029/2019JC015056>.
- Knaff, J. A., C. J. Slocum, and K. D. Musgrave, 2019: Quantification and Exploration of Diurnal Oscillations in Tropical Cyclones. *Mon. Wea. Rev.*, **147**, 2105-2121, doi:10.1175/MWR-D-18-0379.1.
- Goni, G. J., J. A. Knaff, and I - I. Lin, 2018: [The Tropics] Tropical Cyclone Heat Content [in NOAA "State of the Climate in 2017"]. *Bull. Amer. Meteor. Soc.*, **99**(8), S129-S131, doi:10.1175 /2018BAMSStateoftheClimate.1.
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- Sampson, C. R., J. S. Goerss, J. A. Knaff, B. R. Strahl, E. M. Fukada, E. A. Serra, 2018: Tropical cyclone gale wind radii estimates, forecasts and error forecast for the western North Pacific, *Wea. Forecasting*, **33**, 1081-1092, doi:10.1175/WAF-D-17-0153.1.
- Knaff, J. A., C. R. Sampson, and K. D. Musgrave, 2018: Statistical Tropical Cyclone Wind Radii Prediction using Climatology and Persistence: Updates for the Western North Pacific. *Wea. Forecasting*, **33**, 1093-1098, <https://doi.org/10.1175/WAF-D-18-0027.1>.
- Knaff, J.A., C.R. Sampson, and K.D. Musgrave, 2018: An operational rapid intensification prediction aid for the western North Pacific. *Wea. Forecasting*, **33**, 799–811, DOI: /10.1175/WAF-D-18-0012.1

- Goni, G. J., J. A. Knaff, and I - I. Lin, 2018: [The Tropics] Tropical Cyclone Heat Content [in NOAA "State of the Climate in 2017"]. *Bull. Amer. Meteor. Soc.*, **99**(8), S129-S131, doi:10.1175 /2018BAMSStateoftheClimate.1.
- Knaff, J.A. and R.T. DeMaria, 2017: Forecasting tropical cyclone eye formation and dissipation in infrared imagery. *Wea. Forecasting*, **32**, 2103–2116, DOI:10.1175/WAF-D-17-0037.1
- Neetu, S., M. Lengaigne, N. S., H. B. Menon, J. Vialard, M. Mangeas, C. E Menkes, M. M. Ali, I. Suresh, and J. A. Knaff, 2017: Global assessment of tropical cyclones intensity statistical-dynamical hindcasts., *Quart. J. Roy. Meteor. Soc.*, **143**, 2143–2156. DOI:10.1002/qj.3073
- Chavas, D. R., K. A. Reed, and J. A. Knaff, 2017: Physical understanding of the tropical cyclone wind-pressure relationship. *Nature Communications*. DOI: 10.1038/s41467-017-01546-9
- Bender, M. A., T. P. Marchok, C. R. Sampson, J. A. Knaff, and M. J. Morin, 2017: Impact of storm size on prediction of storm track and intensity using the 2016 operational GFDL hurricane model. *Wea. Forecasting*, **32**(4), 1491-1508, <https://doi.org/10.1175/WAF-D-16-0220.1>
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- Wu, T.-C., M. Zupanski, L. D. Grasso, P. J. Brown, C. Kummerow, and J. A. Knaff, 2016: The GSI capability to assimilate TRMM and GPM hydrometeor retrievals in HWRF. *Q.J.R. Meteorol. Soc.*, **142**, 2768–2787. doi:10.1002/qj.2867
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- Knaff, J.A., C. J. Slocum, K. D. Musgrave, C. R. Sampson, and B. R. Strahl, 2016: Using routinely available information to estimate tropical cyclone wind structure. *Mon. Wea. Rev.* **144**:4, 1233-1247. DOI: <http://dx.doi.org/10.1175/MWR-D-15-0267.1>

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- Knaff, J. A., S. P. Longmore, and D. A. Molenaar, 2015: CORRIGENDUM. *J. Climate*, **28**, 8648–8651.
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- Sampson, C.R., and J. A. Knaff, 2015: A consensus forecast for tropical cyclone gale wind radii. *Wea. Forecasting*, **30**, 1397–1403.
- Kaplan, J., C. M. Rozoff, M. DeMaria, C. R. Sampson, J. P. Kossin, C. S. Velden, J. J. Cione, J. P. Dunion, J. A. Knaff, J. A. Zhang, J. F. Dostalek, J. D. Hawkins, T. F. Lee, and J. E. Solbrig, 2015: Evaluating environmental impacts on tropical cyclone rapid intensification predictability utilizing statistical models. *Wea. Forecasting*, **30**, 1374–1396.
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- Knaff, J. A. and C. R. Sampson, 2015: After a decade are Atlantic tropical cyclone gale force wind radii forecasts now skillful?. *Wea. Forecasting*, **30**, 702–709. doi: <http://dx.doi.org/10.1175/WAF-D-14-00149.1>
- Knaff, J.A., S.P. Longmore, R.T DeMaria, D.A. Molenaar, 2015: Improved tropical cyclone flight-level wind estimates using routine infrared satellite reconnaissance. *J. App. Meteor. Climate*. **54**, 463–478.
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- DeMaria, M., C.R. Sampson, J. A. Knaff and K. Musgrave, 2014: Is tropical cyclone intensity guidance improving? *Bull. Amer. Meteor. Soc.*, **95**, 387-398.

- Knaff, J. A., S. P. Longmore, and D. A. Molenaar, 2014: An objective satellite-based tropical cyclone size climatology. *J. Climate*, **27**, 455-476.
- DeMaria M, J.A. Knaff, R. Zehr, 2013: Assessing hurricane intensity using satellites. *Satellite-based applications to climate change*. J.J. Qu, A. Powell, and M.V.K. Sivakumar, Eds, Springer, New York, pp 151-163. doi: http://dx.doi.org/10.1007/978-94-007-5872-8_10
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