

Curriculum Vitae

Justin Alexander Schulte
Atmospheric Scientist/Statistician/Climate Scientist

Contact Information

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Professional Experience

Science Systems and Applications, Inc./NASA
Research Scientist

Lanham, Maryland
June 2018 – July 2019

Worked Performed:

- Prepared literature reviews.
- Created R signal processing software packages to be used for understanding the Indian Monsoon.
- Wrote manuscripts and published work in peer-reviewed journals.

Accomplishments:

- Developed a statistical R software package called The Advanced Biwavelet Package.
- Formalized topological significance testing using the first application of persistent homology to wavelet analysis.
- Constructed a new statistical hypothesis test called the cumulative arc-wise significance test that is specifically designed to detect periodicities in time series and reduce statistical artifacts arising from the multiple testing problem.
- Expanded the wavelet coherence method to a more general nonlinear coherence technique that can quantify the local cross-correlation between higher-order statistical moments in frequency space.
- Identified a new waveform index that can measure local nonlinearities embedded in time series, allowing for the construction of skewness time series and statistical hypothesis tests to evaluate how much the skewness exceeds a specified noise background.
- Created a novel method for assessing the statistical significance of correlation coefficients in the presence of auto-correlated data.
- Used a novel partial correlation approach to teleconnections to identify a new oceanic pattern that can explain about 70% of summer Indian Rainfall variability.

Stevens Institute of Technology
Postdoctoral Scientist

Hoboken, New Jersey
August 2015 – December 2017

Worked Performed:

- Developed new statistical and mathematical methods to improve the accuracy of coastal flood forecasts.
- Applied wavelet and cluster analyses to ensemble flood forecasts.
- Reviewed scientific documents and prepared literature reviews.
- Published new statistical techniques in peer-reviewed journals.
- Conducted meteorological and climatological research and published the research in peer-reviewed journals.
- Presented statistical and climate research results at professional conferences.
- Led the development of a fully automated data quality control algorithm.
- Developed MATLAB statistical software packages.
- Wrote grant proposals and presented seminars.
- Applied complex statistical techniques to large climate and meteorological data sets.

Accomplishments:

- Created a Quality Assurance/Quality Control algorithm that removed nearly 100% of bad total water level data collected from sensors distributed across the New York City area.
- Proposed a new phase-aware statistical theory that led to improvements in the storm surge forecasts produced from the Stevens Flood Advisory System (<http://hudson.dl.stevens-tech.edu/sfas/>).

The Pennsylvania State University
Research Assistant

University Park, Pennsylvania
August 2010 – December 2015

Worked Performed:

- Developed new statistical hypothesis tests in wavelet analysis for extracting signals from time series.
- Published new statistical techniques in peer-reviewed journals.
- Conducted meteorological and climatological research and published the research in peer-reviewed journals.
- Presented statistical and climate research results at professional conferences.
- Developed MATLAB statistical software packages.
- Wrote proposals and presented seminars.
- Applied advanced statistical techniques to large climate and meteorological data sets.

Accomplishments:

- Created geometric and cumulative area-wise tests in wavelet analysis that reduced the number of statistical artifacts arising from the simultaneous testing of multiple hypotheses.
- Identified a new atmospheric pattern that explains more salinity variability across the Chesapeake and Delaware Bays than well-known climate patterns.

Education

The Pennsylvania State University
Advisor: Raymond Najjar, PhD

PhD Meteorology
August 2015

Dissertation Title: “New Methods in Wavelet Analysis and their Application to the Understanding of Hydroclimate Variability across the Mid-Atlantic United States”.

Kean University
Advisor: Shing Yo, PhD

B.S in Meteorology with Mathematics Minor
May 2010

Honors, Awards, Fellowships, and Other Recognition

2017 [Stevens Institute News Article about my statistical research](#)
2014 - 2015 Hudson River Foundation Fellowship
2010 Phi Kappa Phi Honor Society
2010 Chi Epsilon Pi Meteorology Honor Society
2010 Students Parenting with Faculty Research Award
2009 - 2010 Patty and Steve Fastook Scholarship for Communication and the Arts
2008 - 2010 NSF Scholarship in Science, Technology, Engineering, and Mathematics
2008 - 2009 Wilf Family Foundation Scholarship

Teaching

Fall 2017 Guest Lecturer for Hydrodynamics for Prof. Mirjam Furth
Spring 2016 Teaching Assistant to Prof. Raymond Najjar for Atmospheric Dynamics
Spring 2015 Guest Lecturer for Graduate-level Algebraic Topology for Prof. Nigel Higson
Spring 2012 Teaching Assistant to Prof. Peter Bannon for Atmospheric Thermodynamics
Fall 2010 Teaching Assistant to Prof. John Nese for Introduction to Weather Analysis

Publications

Schulte J. A.: Short communication: On the use of the Benjamini– Hochberg procedure in wavelet analysis and its inferior performance to the cumulative arc-wise and area-wise tests. International Journal of Climatology, 1–8, <https://doi.org/10.1002/joc.6515>, 2020.

Schulte, J.A., Policieili, F, Zaitchek, B.: A Waveform Skewness Index for Measuring Time Series Nonlinearity: Applications to the ENSO-Indian Monsoon Relationship, *International Journal of Climatology*, submitted.

Schulte, J.A., Policieili, F, Zaitchek, B.: A Continuum Approach to Understanding Changes in the ENSO-Indian Monsoon Relationship, *Journal of Climate*, in review.

Schulte, J.A., Policieili, F, Zaitchek, B.: A Skewed Perspective of the Indian Rainfall-ENSO Relationship, *Hydrology and Earth System Sciences*, accepted with minor revisions.

Schulte, J. A.: Statistical hypothesis testing in Wavelet Analysis: Theoretical Developments and Applications to Indian Rainfall, *Nonlin. Processes Geophys.*, 26, 91-108, <https://doi.org/10.5194/npg-26-91-2019>, 2019.

Schulte J. A and Lee, S, Long Island Sound Temperature Variability and its Association with the Ridge-trough Dipole and Tropical Modes of Sea Surface Temperature Variability, *Ocean Science*, 2019.

Jordi, A., Georgas, N., Blumberg, A., Yin, L., Chen, Z., Wang, Y., **Schulte, J. A**, Ramaswamy, V., Runnels, D., Saleh, F., A Next Generation of Coastal Ocean Operational Systems: Probabilistic Flood Forecasting at Street Scale, *Bulletin of the American Meteorological Society*, 2019.

Schulte, J. A., Georgas, N., Saba, V., and Howell, P., North Pacific Influences on Long Island Sound Temperature Variability, *J. Climate*, 31, 2745–2769, 2018.

Schulte, J. A and Georgas, N., Theory and Practice of Phase-aware Ensemble Forecasting, *Q J R Meteorol Soc.*, 144, 1415-1428, 2018.

Schulte, J. A., Sub-Ensemble Coastal Flood Forecasting: A Case Study of Hurricane Sandy. *J. Mar. Sci. Eng.*, 5, 59, 2017.

Schulte, J. A., Georgas, N., Saba, V., Howell, P.: Meteorological Aspects of the Eastern North American Pattern with Impacts on Long Island Sound Salinity, *J. Mar. Sci. Eng.*, 5, 26, 2017.

Schulte, J. A., Najjar, R.G, Lee, S.: Salinity and Streamflow Variability in the Mid-Atlantic Region of the United States and its Relationship with Large-scale Atmospheric Circulation Patterns, *Journal of Hydrology*, 550, 65-79, 2017.

Schulte, J. A., Lee, S.: Strengthening North Pacific Influences on United States Temperature Variability, *Scientific Reports*, 124, 2017.

Schulte, J. A., Najjar, R.G, Li, M.: Impacts of Climate Modes on Streamflow in the Mid-Atlantic Region of the United States, *J. Hydrology: Regional Studies*, 5, 80-99, 2016.

Schulte, J. A., Cumulative Areawise Testing in Wavelet Analysis and its Application to Geophysical Time Series, *Nonlin. Processes Geophys.*, 23, 45-57, doi:10.5194/npg-23-45-2016, 2016.

Schulte, J. A., Wavelet Analysis for Non-stationary, Nonlinear Time Series, *Nonlin. Processes Geophys.*, 23, 257-267, doi:10.5194/npg-23-257-2016, 2016.

Georgas, N., Yin, L., Jiang, Y., Wang, Y., Howell, P., Saba, V., **Schulte, J A.**, Orton, P., Wen, B. An Open-Access, Multi-Decadal, Three-Dimensional, Hydrodynamic Hindcast Dataset for the Long Island Sound and New York/New Jersey Harbor Estuaries. *J. Mar. Sci. Eng.*, 4, 48, 2016.

Georgas, N., Blumberg, A., Herrington, T., Wakeman, T., Saleh, F., Runnels, D., Jordi, A., Ying, K., Yin, L., Ramaswamy, V., Yakubovskiy, A., Lopez, O., McNally, J., **Schulte, J. A.**, Wang, Y. The Stevens Flood Advisory System: Operational H3e Flood Forecasts For The Greater New York / New Jersey Metropolitan Region. *International Journal of Safety and Security Engineering*. 6, 648 – 662, 2016.

Schulte, J. A., Duffy, C., and Najjar, R. G.: Geometric and Topological Approaches to Significance Testing in Wavelet Analysis, *Nonlin. Processes Geophys.*, 22, 139-156, doi:10.5194/npg-22-139-2015, 2015.

Published Statistical Software

Schulte, J. A.: The Advanced Biwavelet R Software Package (<http://justinschulte.com/wavelets/advbiwavelet.html>)

Schulte, J. A.: Geometric and Topological Methods for Significance Testing in Wavelet Analysis (available through MATLAB File Exchange, file ID: #50110).

Schulte, J. A.: Cumulative Areawise Testing in Wavelet Analysis (available through MATLAB File Exchange, file ID: #52325).

Schulte, J. A.: Higher-order Wavelet Analysis (available through MATLAB File Exchange, file ID: #54671).

Schulte, J. A.: Global Wavelet Coherence (available through MATLAB File Exchange, file ID: #54682).

Schulte, J. A.: Cumulative Arc-wise Testing in Wavelet Analysis (available through MATLAB File Exchange).

Conference Presentations

Schulte, J. A and Georgas, N. Theory and Practice of Phase-aware Ensemble Forecasting. Presented at the American Meteorological Conference Meeting, January 2017.

Georgas, N. and **Schulte, J. A.** The Stevens Flood Advisory System. Super-ensemble flood forecasts for the New York/New Jersey Harbor and the surrounding region. Presented at the 7th NCEP Ensemble Users Workshop, June 2016.

Schulte, J. A, Georgas, N., Blumberg, A., Orton, P., Saba, V., Howell, P., Yin, L., Wang, Y., Yu Jiang, Rubin Paredes, Ziyi Wu, and Yuli Zhao. Meteorological and Climate Forcing of Temperature and Salinity Variability in the Long Island Sound. Mid-Atlantic Bight Physical Oceanography and Meteorology Meeting, November 2015.

Schulte, J.A., and R.G. Najjar, 2014, Variability of Chesapeake Bay Salinity: Climate Mode Associations, Presented at the Ocean Sciences Meeting.

Schulte, J.A., and R.G. Najjar, 2013, Climate Modes and Their Impact on Mid-Atlantic Streamflow Variability, Presented at the Delaware Bay Meeting.

Schulte, J.A., and R.G. Najjar, 2013, Climate Modes and Their Impact on Mid-Atlantic Streamflow Variability, Presented at the Ocean Sciences Meeting.

Schulte, J.A., and R.G. Najjar, 2013, The Temporal and Spatial Variability of Chesapeake Bay Salinity: Climate Mode Associations, Presented at the Mid-Atlantic Bight Physical Oceanography and Meteorology Conference.

Schulte, J.A., and R.G. Najjar, 2012, Streamflow Variability and its Relationship to Dominant Modes of Climate Variability, Presented at the Mid-Atlantic Bight Physical Oceanography and Meteorology Meeting.

Schulte, J.A., and R.G. Najjar, 2011, An Assessment of Mid-Atlantic Streamflow and its Relationship to the North Atlantic Oscillation and the Pacific Northern-American Teleconnection, Presented at the Mid-Atlantic Bight Physical Oceanography and Meteorology Conference.

Schulte, J.A., Wuestenburg, A., Fadeski, D., and P. Croft, 2010, Convective Initiation Over New Jersey, Presented at the American Meteorological Society Conference.

Schulte, J.A., Wuestenburg, A., Fadeski, D., and P. Croft, 2009, Convective Initiation Over New Jersey, Presented at the National Weather Association Conference.

Schulte, J.A., and Y. Shing, 2008, Analytical Models of Sea Dynamics, Presented at the National Weather Association Conference.

Invited Talks

Schulte, J. A. 2019, Phase-aware Statistics and their Application to Storm Surge Forecasting, presented on October 31, 2019 at the Virginia Institute of Marine Science as part of the physical science seminar.

Schulte, J. A., Understanding Historical Streamflow and Salinity Variability in the Mid-Atlantic Region of the United States: The Wavelet Approach, presented on June 16, 2015 at the Stevens Institute of Technology.

Other Talks

Schulte, J.A., 2014, Historical Impacts of Climate Modes on the Chesapeake Bay, Delaware River, and Hudson River Estuaries, Presented at Earth Talks at The Pennsylvania State University.

Schulte, J.A., 2014, Advances in Wavelet Analysis, Presented in Earth System Science Center Climate Seminar at The Pennsylvania State University.

Schulte, J.A., 2015, Persistent Homology and Spectral Analysis, Presented in the Department of Mathematics at The Pennsylvania State University.

Schulte, J.A., 2015, Cumulative Areawise Testing in Wavelet Analysis and its Application to the Pacific Decadal Oscillation, Presented in the Earth System Science Center Climate Seminar at The Pennsylvania State University.

Professional Service

2019 - Present	Reviewer for Journal of Hydrology
2018 - Present	Reviewer for Journal of Geophysical Research Oceans
2017 - Present	Reviewer for International Journal of Climatology
2016 - Present	Reviewer for Hydrology and Earth System Science
2015 - Present	Reviewer for Frontiers in Earth Science

2012 - Present

Reviewer for Estuaries and Coasts

2009

Presented a weather forecast discussion at the NWS Conference