Charlotte L. Haley

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U.S. Citizen
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1 Resume

1.1 Degrees attained

2009-2014	**Doctor of Philosophy, Statistics** Queen's University, Kingston, Ontario, Canada
2008-2009	**Master of Science, Statistics** Queen's University
2004-2008	**Bachelor of Science with Honors, Mathematics** Dalhousie University, Halifax, Nova Scotia, Canada Dean's List

1.2 Positions held

2017-	**Assistant Computational Statistician** Mathematics and Computer Science Division Argonne National Laboratory (ANL), Lemont, IL
2018-	**University of Chicago Consortium for Advanced Science and Engineering** Joint appointment - Research Scholar University of Chicago, Chicago, IL
2014-2017	**Postdoctoral Appointee** Argonne National Laboratory, Lemont, IL Mathematics and Computer Science Division

1.3 Honors and Awards

2019	**Argonne Physical Sciences and Engineering Excellence Award in the Programmatic Scientific Achievement category** With Raymond Osborn, Stephan Rosenkranz, and Mihai Anitescu
2013	**Queen Elizabeth II Graduate Scholarship in Science and Technology** Awarded to graduate students enrolled in science and technology disciplines
2010-2011	**Ontario Graduate Scholarship** Merit-based scholarship awarded to a full-time graduate student in Ontario
2011-2013	**Student Travel Awards** Statistical Society of Canada Congress June 2011 Applied Mathematics, Modeling and Computational Science Meeting Aug. 2013

2009 & 2012	**R. Samuel Maclaughlan Scholarship** (Queen's) Awarded to first class master's and doctoral students
2008	**Ralph and Frances Jeffery Mathematics Scholarship** (Dalhousie) Awarded to a graduating senior in honors mathematics

1.4 Membership in professional societies

2010-	American Statistical Association (ASA) Professional Statistician (PStat®) Chicago Chapter ASA Member
2024-	Society for Industrial and Applied Mathematics (SIAM) Member Activity group on Uncertainty Quantification Activity group on Data Science Activity group on Equity, Diversity, and Inclusion
2009-	IEEE member
2009-2018	American Mathematical Society (AMS)
2013-2017	American Geophysical Union (AGU)

2 Professional Activities

2.1 Argonne - Projects directed/managed, committee memberships, mentoring, recruiting, supervising, seminar coordination, etc.

Graduate Student Mentoring

2024	**Devam Shah** Givens Fellow, Argonne National Lab, Summer 2024 Currently an undergraduate in Mathematics at University of Illinois Project: Spectrum analysis for diffuse scattering
2023	**Fengyu Yang** Givens Fellow, Argonne National Lab, Summer 2023 Currently a Doctoral Candidate in Applied Mathematics, University of North Carolina Chapel Hill Project: Optimization of probabilistic models for diffuse scattering With Mihai Anitescu
2021-2023	**Justin Harrell** Givens Fellow, Argonne National Lab, Summer 2023 Currently a Doctoral Candidate in Astrophysics, University of Delaware Visiting Student, Argonne National Laboratory, 2021-2023 Project: Frequency-Domain Analysis of Radial Velocity Datasets
2021-2023	**Victor Ramirez Delgado** Currently a Doctoral Candidate in Astrophysics, University of Delaware Visiting Student, Argonne National Laboratory, 2021-2022 Project: Frequency-Domain Analysis of Radial Velocity Datasets With Sarah Dodson-Robinson.
2019	**Jessica Kunke** Research Aide, Argonne National Laboratory Master's Program in Statistics, University of Chicago

Project: Forecasting of solar insolation using a Gaussian process spatio-temporal model trained on data collected by geostationary satellites imaging the continental U.S.
Now a doctoral student at University of Washington

2016-2018 **Christopher Geoga**
B.Sc. Math & Stats, University of Chicago
Predoctoral Appointee, Argonne National Laboratory
Projects: (i) Multitaper spectrum analysis implementation in Julia, (ii) Detection & estimation of interarea oscillations in power networks, (iii) Spacetime spectrum analysis with application to fluid dynamics
Now an assistant professor at UW Madison

K-12 Mentoring

2017-2019 **Argonne Afro-Academic, Cultural, Technological and Scientific Olympics (ACT-SO) High School Research Program Mentor**
Two projects:
1. Jasmine Walker, 2017-2018, High School Senior
Project: A Hurricane-Resistant Shelter
Won gold in the architecture category and bronze in the engineering category in the local competition in Chicago. Advanced to the national competition in San Antonio and won gold in the architecture category.
Now an architectural engineering undergraduate at Purdue.
2. Tiffany Fitzpatrick, 2018-2019, High School Senior
Project: Detection of Ventricular Arrhythmias from Electrocardiograms using Machine Learning
Won gold in the computer science category in the local competition in Chicago. Advanced to the national competition in Detroit and won gold.
Now an undergraduate student in computer science at Xavier University.

Other Mentoring

2019 **Argonne New-Employee Navigator Program Mentor**
Served as a staff navigator to one new postdoctoral employee

Committee Memberships and Seminar Coordination

2017-2019 **Committee Member: Argonne Mathematics & Computer Science Postdoctoral Hiring Committee**
Prescreened and set up interviews for 12 postdoctoral candidates. Attended career fairs representing Argonne

March 2016 **Recruiting: Argonne Mathematics & Computer Science (MCS) Career Expo**
Traveled to a career fair at the University of Michigan to recruit new postdocs

2015 & 2016 **Seminar Coordination: Laboratory for Advanced Numerical Simulation (LANS) Argonne Student Symposium (SASSy)**
Symposium Organizer
Organized a two-day symposium in which ≈ 20 students in the LANS group presented the results of their summer research.

2015 & 2016	**Seminar Coordination: LANS Seminar Coordinator** Hosted and scheduled speakers for the weekly mathematics seminar. Topics included advanced optimization, numerical analysis, fluid dynamics, and statistics.

Volunteer Activities & Outreach

April 2019	**Science Careers in Search of Women (SCSW) student luncheon** Volunteer Mentor to grade 8 girls
March 2019	**International Women's Day Celebrations** Participant Argonne #BalanceforBetter
April 2018	**Science Speaks Chicago** Speaker & Poster - Asteroseismology Adler Planetarium
Nov. 2017	**Hour of Code** Visited a south-side middle school and gave a presentation about Argonne and led a coding exercise to two classes of grade eight students
April 2017	**Science Careers in Search of Women (SCSW) student luncheon** Volunteer Mentor to grade 8 girls
2017 & 2018	**Introduce a Girl to Engineering Day** Volunteer Mentor to grade 8 girls
2016	**Argonne Open House** Volunteer

2.2 DOE - Committee memberships, white papers, point of contact, etc.

Editorial Boards

2023	**Department of Energy Proposal Reviewer** Basic Energy Sciences
2022	**Department of Energy Proposal Reviewer** Advanced Scientific Computing Research

White papers

[1] **Haley, C. L.**, Geoga, C. J., and Anitescu, M. Jan. 2018. "Adaptive nonparametric spectra for kernel learning". DOE ASCR Scientific Machine Learning Workshop. North Bethesda, MD.

[2] **Haley, C. L.** and Anitescu, M. Aug. 2017. "Advanced statistical analysis for high-resolution space-time phenomena". DOI: 10.6084/m9.figshare.5313463.v2. URL: https://figshare.com/articles/statsWP_pdf/5313463.

2.3 Professional Community

2.3.1 Editorial boards, conference committees, working groups, etc.

Editorial Boards

July 2024	**NSF FDT Biotech Panelist**
Ongoing	**Journal Referee** Circuits, Systems, and Signal Processing

	Journal of Geophysical Research, Earth & Space Science, Canadian Journal of Statistics, Computational Statistics & Data Analysis, Nature, IEEE Signal Processing Transactions, IEEE Signal Processing Letters, IEEE Proceedings Technometrics
2022	**NSF Proposal Reviewer** Statistics Panel
April 2017	**Prize Committee: Judge** SIAM Student Paper Prize
2015-2016	**Editorial Boards: De Gruyter Nanospectroscopy** Language Editor
2012-2013	**Editorial Boards: Versita Open Access Publications** Language Editor
2010-	**Conference Abstract Reviewer, IEEE** e.g., i-CADER 2014, ICoSSEET 2014, ICNC 2014, IPCOST 2014

Conference Committees

June 2022	**Workshop Co-organizer** Banff International Research Station Workshop on Multitaper Spectral Analysis There were 50 participants. `http://www.birs.ca/events/2022/2-day-workshops/22w2230/`
Mar. 2021	**Minisymposium Co-organizer** SIAM Conference on Computational Sciences and Engineering 2021 Characterization and prediction of rare and extreme events in complex systems In two parts, comprising eight speakers
April 2020	**Minisymposium Co-organizer** SIAM Uncertainty Quantification 2020 Extremes of Spacetime Processes Canceled due to COVID-19
2015 & 2016	**Laboratory for Advanced Numerical Simulation Summer Argonne Student Symposium (SASSy)** Organizer for the final presentations of 30-50 summer students' research Topics included advanced optimization, numerical analysis, fluid dynamics, and statistics.
Sept. 2014	**Argonne Postdoctoral Symposium** Poster session volunteer organizer
Aug. 2014	**Joint Statistical Meetings Contributed Session** Organizer Section on Physical and Engineering Sciences Applied Spectrum Analysis
Aug. 2013	**Minisymposium Co-organizer** International Conference on Applied Mathematics, Modeling and Computer Simulation 2013 Multitaper Spectrum Analysis

2.3.2 Academic positions, teaching, student advising, etc.

University of Delaware

2022-2026	**Thesis Committee: Victor Ramirez Delgado (University of Delaware)** External Examiner
2022-2026	**Thesis Committee: Amna Ejaz (University of Delaware)** External Examiner
2020-2025	**Thesis Committee: Justin Harrell (University of Delaware)** External Examiner

University of Chicago

Sept. 2018	**Teaching: Introductory Time Series Bootcamp Instructor** University of Chicago Primary instructor of a time series bootcamp covering introductory definitions to research-quality analysis. Participants were University of Chicago graduate students participating in an NSF Research Traineeship program. Laboratories (in `R`) and lectures were 2.5 hours daily for two weeks.

Queen's University

Fall 2011	**Teaching: MTHE 224 Engineering Mathematics Course Instructor** Queen's University Primary instruction and curriculum development for a 13-week second year engineering mathematics course. Course material included ordinary differential equations and introductory statistics with tutorials and laboratory work in Matlab.
Spring 2011	**Teaching: Teaching Apprenticeship** Queen's University Lectured for 3 course hours in Introductory Calculus for math majors.
2009-2013	**Teaching: Math and Stats private tutor** Private tutoring in calculus, differential equations, introductory statistics, complex variables, real analysis, and others.
2010 & 2013	**Teaching: Tutorial leader** Queen's University: Differential Equations and $\epsilon - \delta$ Calculus for math majors Did practice problems and exercises once weekly for a group of undergraduates
2008-2013	**Teaching: Teaching Assistant** Queen's University Graded assignments, proctored exams, and assisted students at the math help desk for a total of 130+ hours
2014	**Student Advising: Paul Wilson** B.Sc. Math & Stats, Queen's University National Science and Engineering Research Council of Canada (NSERC) Undergraduate Research Assistant (USRA)

	Co-advised by David J. Thomson.
2013	**Student Advising: Julian Fortin**
	B.Eng. (Apple Math) Queen's University
	NSERC USRA Co-advised by David J. Thomson.

2.3.3 Others

2012-2014	**Queen's Graduate Math Society**
	President 2012 & Treasurer 2013-2014
2012	Queen's Math Dept Graduate Seminar
	Coordinator
2011-2012	**Queen's Math & Stats Dept.**
	Tenure, Renewal, and Promotions committee member
2010-2013	**Mathemagics Math Camp for Girls**
	Volunteer Activity leader and Co-organizer
2006-2008	**Dalhousie Undergraduate Math and Stats Society**
	Vice President 2006-2007 & President 2007-2008

3 Research Products

Refereed Journal Articles

[1] Yoh, N., **Haley, C. L.**, and Z. Burivalova. June 2024. "Time Series Methods for the Analysis of Soundscapes and Other Cyclical Ecological Data". *Methods in Ecology and Evolution*. DOI: 10.1111/2041-210X.14361. URL: https://dx.doi.org/10.1111/2041-210X.14361.

[2] Dodson-Robinson, S. E. and **Haley, C. L.** Dec. 2023. "Optimal Frequency-domain Analysis for Spacecraft Time Series: Introducing the Missing-data Multitaper Power Spectrum Estimator". 167.1, p. 22. DOI: 10.3847/1538-3881/ad0c58. URL: https://dx.doi.org/10.3847/1538-3881/ad0c58.

[3] Dodson-Robinson, S. E., Ramirez Delgado, V., Harrell, J., and **Haley, C. L.** Jan. 2022. "Magnitude squared coherence: A powerful tool for disentangling Doppler planet discoveries from stellar activity". 163.4. DOI: 10.3847/1538-3881/ac52ed.

[4] Rao, V., **Haley, C. L.**, and Anitescu, M. Feb. 2022. "LaplaceInterpolation.jl: A Julia package for fast interpolation on a grid". *Journal of Open Source Software* 7.70, p. 3766. DOI: 10.21105/joss.03766.

[5] Upreti, P., Krogstad, M., **Haley, C. L.**, Anitescu, M., Rao, V., Poudel, L., Chmaissem, O., Rosenkranz, S., and Osborn, R. Feb. 2022. "Order-Disorder Transitions in $(Ca_xSr_{1-x})_3Rh_4Sn_{13}$". *Phys. Rev. Lett.* 128 (9), p. 095701. DOI: 10.1103/PhysRevLett.128.095701. URL: https://link.aps.org/doi/10.1103/PhysRevLett.128.095701.

[6] Zhao, L. L., [...], **Haley, C. L.**, et al. Apr. 2022. "The EXPRES Stellar Signals Project II. State of the Field in Disentangling Photospheric Velocities". 163.4, 171, p. 171. DOI: 10.3847/1538-3881/ac5176. arXiv: 2201.10639 [astro-ph.EP].

[7] **Haley, C. L.** Sept. 2021. "Missing-data multitaper coherence estimation". *IEEE Signal Processing Letters* 28, pp. 1704–1708. DOI: 10.1109/LSP.2021.3105926.

[8] **Haley, C. L.** and Geoga, C. J. Nov. 2020. "Multitaper.jl: Julia software for frequency-domain analysis of time series". *Journal of Open Source Software* 5.55, p. 2463. DOI: 10.21105/joss.02463.

[9] Geoga, C. J., **Haley, C. L.**, Siegel, A., and Anitescu, M. Feb. 2018. "Frequency-wavenumber spectral analysis of spatiotemporal flows". *Journal of Fluid Mechanics* 848, pp. 545–559. DOI: 10.1017/jfm.2018.366.

[10] **Haley, C. L.** and Anitescu, M. Apr. 2017. "Optimal bandwidth for multitaper spectrum estimation". *IEEE Signal Processing Letters* 24 (11), pp. 1696–1700. DOI: 10.1109/LSP.2017.2719943.

[11] **Haley, C. L.** Feb. 2016. "Mathematical physics: Glitches in time". *Nature* 532, pp. 450–451. DOI: 10.1038/532450a.

[12] Michael, K. A., **Haley, C. L.**, Baranchuk, A., Simpson, C. S., Abdollah, H., and Redfearn, D. P. Apr. 2015. "Failed anti-tachycardia pacing can be used to differentiate atrial arrhythmias from ventricular tachycardia in implantable cardioverter-defibrillators". *Europace* 17.1, pp. 78–83. DOI: 10.1093/europace/euu169.

[13] Somani, R., Mohajer, K., **Haley, C. L.**, Simpson, C. S., Abdollah, H., Baranchuk, A., Redfearn, D. P., and Michael, K. A. June 2014. "The periprocedural use of Dabigatran in patients undergoing left atrial ablation for atrial fibrillation". *Cardiovasc Ther.* 32.5, pp. 198–201. DOI: 10.1111/1755-5922.12082.

[14] Thomson, D. J. and **Haley, C. L.** Jan. 2014. "Spacing and shape of peaks in non-parametric spectrum estimates". *Proceedings of the Royal Society of London Series A* 470.2167, p. 20140101. DOI: 10.1098/rspa.2014.0101.

[15] **Haley, C. L.**, J. Gula L., Miranda, R., Baranchuk, A., Michael, K. A., Simpson, C. S., Abdollah, H., West, A. J., Akl, S. G., and Redfearn, D. P. Aug. 2013. "Validation of a novel algorithm for quantification of fractionation in atrial fibrillation electrograms." *Europace* 15.3, pp. 447–452. DOI: 10.1093/europace/eus361.

Invited talks at major conferences and symposia

[1] **Haley, C. L.** Apr. 2018. *Frequency wavenumber analysis of spatiotemporal flow structures.* Minneapolis, MN: Forecasting from Complexity Workshop, Institute for Mathematics and its Applications.

Other Talks

[1] **Haley, C. L.** May 2024. *On spatiotemporal spectrum estimation.* Los Alamos, NM: Los Alamos National Laboratory.

[2] **Haley, C. L.** Apr. 2022. *Bandlimited Functions for Missing Data and Unequally Spaced Astronomical Time Series.* Lemont, IL: Laboratory for Applied Mathematics, Numerical Software and Statistics Seminar.

[3] **Haley, C. L.** June 2022. *Missing-Data Coherency Estimation.* Banff, Canada: BIRS Multitaper Spectrum Estimation Workshop.

[4] **Haley, C. L.** Aug. 2021. *Coherence estimation for data with gaps.* Seattle, WA: Joint Statistical Meetings.

[5] **Haley, C. L.** Dec. 2021. *Missing-Data Coherency Estimation.* Lemont, IL: MACSER Presentation to Program Manager.

[6] **Haley, C. L.** Jan. 2020. *Coarsening time series.* Chicago, Il: University of Chicago Dept of Geostatistics.

[7] **Haley, C. L.** Mar. 2020. *Extremes of dynamical systems and spatiotemporal processes.* Santa Fe, NM: Conference on Data Analysis (CoDA).

[8] **Haley, C. L.** Jan. 2020. *MACSER data science activities.* Lemont, IL: MACSER Annual Meeting.

[9] **Haley, C. L.** Jan. 2019. *Advanced spectral data analysis*. Rockville, MA: Department of Energy Applied Mathematics Principal Investigators' Meeting.

[10] **Haley, C. L.** Oct. 2019. *Energy-concentrating tapering functions for higher dimensional spectral analysis*. Ithaca, NY: DOE Basic Energy Sciences Grant Kickoff.

[11] **Haley, C. L.** Aug. 2019. *Spectral-in-time formulations for environmental spacetime processes*. Denver, Co: Joint Statistical Meetings.

[12] **Haley, C. L.** June 2018. *Adaptive nonparametric spectra for kernel learning*. University of Southern California, Los Angeles, CA: Research Challenges, Opportunities at the interface of Machine Learning, and Uncertainty Quantification.

[13] **Haley, C. L.** Jan. 2018. *Adaptive nonparametric spectra for kernel learning*. North Bethesda, MD: DOE ASCR Scientific Machine Learning Workshop.

[14] **Haley, C. L.** May 2018. *Extremes, Gaussian processes, and spectral models for Doppler Lidar wind speed*. Berkeley, CA: SAMSI Working Group on Spatiotemporal Statistical Extremes.

[15] **Haley, C. L.** July 2018. *Quantification of multiscale second-order flow structures in the wake of a square wall-mounted cylinder under two inflow scenarios*. New York City, NY: 13th World Congress on Computational Mechanics - 2nd Pan American Congress on Computational Mechanics.

[16] **Haley, C. L.** July 2018. *Spectral analysis for comparison of second-order flow structure in DNS simulations*. Glasgow, Scotland: 6th European Conference on Computational Mechanics (Solids, Structures and Coupled Problems).

[17] **Haley, C. L.** Aug. 2018. *Spectral methods for kernel learning*. Vancouver, BC: Joint Statistical Meetings.

[18] **Haley, C. L.** Aug. 2017. *Detection and estimation of oscillatory components in power networks*. Baltimore, MA: Joint Statistical Meetings.

[19] **Haley, C. L.** Oct. 2017. *On extreme values in vertical Doppler LIDAR wind speed*. Raleigh, NC: SAMSI.

[20] **Haley, C. L.** Feb. 2017. *On multitaper spatiotemporal spectrum estimation*. Lemont, IL: Laboratory for Advanced Numerical Simulations (LANS) Seminar.

[21] **Haley, C. L.** Feb. 2017. *On multitaper spatiotemporal spectrum estimation*. Chicago, IL: University of Chicago Dept of Statistics, Stein research group.

[22] **Haley, C. L.** Jan. 2017. *On multitaper spatiotemporal spectrum estimation*. Toronto, ON: University of Toronto.

[23] **Haley, C. L.** Sept. 2017. *Spectral analysis of spatiotemporal data*. Rockville, MA: Department of Energy Applied Mathematics Principal Investigators' Meeting.

[24] **Haley, C. L.** Nov. 2016. *Harmonic analysis of modern synchrophasor measurements*. Lemont, IL: Argonne M2ACS Research Group.

[25] **Haley, C. L.** Aug. 2016. *Optimal bandwidth for multitaper spectrum estimation*. Chicago, IL: Joint Statistical Meetings.

[26] **Haley, C. L.** Aug. 2015. *Cyclostationary models for solar irradiance*. Seattle, WA: Joint Statistical Meetings.

[27] **Haley, C. L.** Feb. 2015. *Propagation of solar oscillations to secondary cosmic rays*. Lemont, IL: Laboratory for Advanced Numerical Simulations (LANS) Seminar.

[28] **Haley, C. L.** Apr. 2015. *Two dimensional spatiotemporal spectrum estimation*. Chicago, IL: University of Chicago Dept. of Statistics, Stein research group.

[29] **Haley, C. L.** Apr. 2014. *A comparison of contemporary Metrics for the identification of complex fractionated electrograms*. Munich, DE: European Cardiac Arrhythmia Society.

[30] **Haley, C. L.** Sept. 2014. *A Lorentzian model for solar modes*. Chicago IL: STATMOS Annual Meeting.

[31] **Haley, C. L.** Oct. 2014. *Estimation and detection of individual solar oscillations*. Lemont, IL: Postdoctoral Research and Career Symposium.

[32] **Haley, C. L.** Aug. 2014. *Multivariate spectral analysis of 40 years of multidirectional muon observations*. Boston MA: Joint Statistical Meetings.

[33] **Haley, C. L.** Dec. 2013. *Propagation of solar oscillations to secondary cosmic rays*. San Francisco, CA: American Geophysical Union.

[34] **Haley, C. L.** Aug. 2013. *Propagation of solar oscillations to secondary cosmic rays*. Waterloo, ON: Applied Mathematics, Modeling and Computational Science Conference.

[35] **Haley, C. L.** Feb. 2013. *Solar modal structure as observed by neutron monitors*. Kingston, ON: Division of Atmospheric and Space Physics Workshop.

[36] **Haley, C. L.** Oct. 2013. *Solar modal structure in the cosmic ray background*. Petit Rouge, Qc: Canadian Solar Workshop.

[37] **Haley, C. L.** Aug. 2013. *Spacing and shape of peaks in nonparametric spectrum estimates*. Montreal, QC: Joint Statistical Meetings.

[38] **Haley, C. L.** May 2013. *Spatial and temporal variability of environmental noise in Toronto*. Edmonton, AB: Statistical society of Canada Congress, Case Study Competition.

[39] **Haley, C. L.** June 2011. *A novel metric for quantifying percentage fractionation in AF electrograms*. Kingston, ON: International Conference in Electrocardiology.

[40] **Haley, C. L.** June 2011. *Detection of changes in activation in ECG time series modeling*. Wolfville, NS: Statistical Society of Canada Congress.

[41] **Haley, C. L.** May 2011. *Electroanatomic mapping systems to guide catheter ablation for atrial fibrillation*. Kingston, ON: Kingston General Hospital Research Showcase.

[42] **Haley, C. L.** May 2008. *An explicit formula for the Stirling numbers of the second kind via multinomial coefficients*. Toronto, ON: Canadian Undergraduate Mathematics Conference.

Software and equipment developed

[1] **Haley, C. L.** Jan. 2022. *Slepians.jl: Functions of limited spatiospectral concentration*. DOI: 10.11578/dc.20220103.2. URL: https://www.osti.gov/biblio/1837948.

[2] Rao, V. R. and **Haley, C. L.** Jan. 1, 2022. *LaplaceInterpolation.jl: Fast gridded interpolation in arbitrary dimensions*. Version 1.0. URL: https://github.com/vishwas1984/LaplaceInterpolation.jl.git.

[3] **Haley, C. L.** and Geoga, C. J. Jan. 1, 2020. *Multitaper.jl*. Version 0.2.0. URL: https://github.com/lootie/Multitaper.jl.git.