NATHAN LENSSEN, Ph.D.

Dept. of Atmospheric and Oceanic Sciences, CU Boulder, 311 UCB, Boulder, CO 80309-0311
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EDUCATION

Columbia University
Ph.D. in Earth and Environmental Sciences — October 2022
M.Phil. in Earth and Environmental Sciences — May 2021
M.A. in Earth and Environmental Sciences — May 2019

Columbia University
M.A. in Statistics (M.A./Ph.D. Program) — February 2017

Claremont McKenna College
B.A. in Mathematics with Honors — May 2013
B.A. in Physics with Honors — May 2013

Budapest Semester in Mathematics — Fall 2011

HONORS AND AWARDS

Teaching Scholars Fellowship, Columbia University Graduate School of Arts and Sciences — 2021
Dean's Fellowship, Columbia University (Earth and Environmental Sciences) — 2017
National Science Foundation Graduate Research Fellowship (NSF GRFP) — 2014
Dean's Fellowship, Columbia University (Statistics) — 2014
Cum Laude, Claremont McKenna College — 2013
Best Senior Thesis in Mathematics, Claremont McKenna College — 2013

EXPERIENCE

Assistant Teaching Professor — Starting August 2023
Colorado School of Mines, Dept. of Applied Math and Statistics — *Golden, CO*

Visiting Scientist — September 2022 - Present
National Center for Atmospheric Research, Climate Analysis Section — *Boulder, CO*

Postdoctoral Research Fellow — August 2022 - Present
University of Colorado Boulder, Dept. of Atm. & Ocea. Sciences — *Boulder, CO*

Graduate Research Assistant — September 2017 - July 2022
Dr. Gavin Schmidt, NASA Goddard Institute for Space Studies — *New York, NY*

Graduate Research Assistant — September 2017 - January 2022
Prof. Lisa Goddard, Columbia University, Dept. of Earth and Env. Sciences — *New York, NY*

Scientific Programmer/Analyst — January 2017 - August 2017
NASA Goddard Institute for Space Studies — *New York, NY*

Graduate Research Assistant — June 2016 - December 2016
Prof. Tian Zheng, Columbia University, Dept. of Statistics — *New York, NY*

Associate Scientist I/II — June 2013 - August 2014
National Center for Atmospheric Research, Applied Statistics Group — *Boulder, CO*

Research Assistant — April - December 2012
Prof. Philip Lubin, UC Santa Barbara, Dept. of Physics — *Santa Barbara, CA*

Research Assistant — Summer 2011
Dr. Gregor Mura, Heinrich Heine University, Dept. of Physics — *Düsseldorf, Germany*

PEER-REVIEWED PUBLICATIONS

† indicates student or mentee co-author

K. Schwarzwald† and N. Lenssen (2022) "The Importance of Internal Climate Variability in Climate Impact Projections" *Proceedings of the National Academy of Sciences.* DOI: 10.1073/pnas.2208095119

N. Lenssen, L. Goddard, and S. Mason (2020), "Seasonal Forecast Skill of ENSO Teleconnection Maps" *Weather and Forecasting.* DOI: 10.1175/WAF-D-19-0235.1

N. Lenssen, G. A. Schmidt, J. E. Hansen, M. Menne, R. Ruedy, A. Persin, and D. Zyss (2019), "Improvements in the Uncertainty Model in the Goddard Institute for Space Studies Surface Temperature (GISTEMP) analysis" *J. Geophys. Res. Atmos.* DOI: 10.1029/2018JD029522

- Fifth-most cited article in J. Geophys. Res. of articles published 2016–2020
- Cited in IPCC AR6 WGI Chapters 2, 3, and 10

N. Lenssen, A. Hannart, and D. Hammerling (2018), "Simulation Testbed for Trend Detection and Attribution Methods" *NCAR Technical Note.* DOI: 10.26024/xfmm-hj36

N. Lenssen, D. Nychka, D. Hammerling, and S. A. McGinnis (2016), "A Tutorial for Using 'Rmpi' on the NCAR/Wyoming Supercomputer" *NCAR Technical Note.* DOI: 10.5065/D6X63K5S

N. Lenssen, D. Needell (2014), "An Introduction to Fourier Analysis with Applications to Music" *Journal of Humanistic Mathematics.* DOI: 10.5642/jhummath.201401.05

PAPERS IN PREPARATION

† indicates student or mentee co-author

C. Tagami†, N. Lenssen (*under review*), "Projected Economic Efficiency of the NY/NJ Outer Harbor Barrier" *The American Journal of Undergraduate Research.*

- Expanded final paper from EESC 3114 "Climate Impacts on Humans in NYC," a course I designed and taught at Columbia University in Spring 2022

C. Tang, N. Lenssen, Y. Wei, T. Zheng (*under review*), "Wasserstein Distributional Learning" *The 26th International Conference on Artificial Intelligence and Statistics.* https://arxiv.org/abs/2209.04991

N. Lenssen, G. A. Schmidt, J. E. Hansen, M. Hendrickson, M. Menne, R. Ruedy (*in prep*), "A GISTEMPv4 Observational Uncertainty Ensemble: Regional and Monthly Uncertainty"

N. Lenssen, L. Goddard, S. Mason, Y. Kusnir, R. Miller (*in prep*), "Decomposition and Attribution of Observed Global and Regional Temperature Variability"

N. Lenssen, L. Goddard, P. DiNezio, Y. Kushnir, S. Mason, M. Newman, Y. Okumura (*in prep*), "Initialized and Uninitialized ENSO Predictability in Year 2"

P. Jacobs, N. Lenssen, G. A. Schmidt, R. A. Rohde, M. Hendrickson (*in prep*) "The Arctic Is Now Warming Four Times As Fast As the Rest of the Globe"

SOFTWARE

D. Nychka, D. Hammerling, S. Sain, and N. Lenssen (2016): "LatticeKrig: Multiresolution Kriging Based on Markov Random Fields." *R package version 6.2.* https://www.image.ucar.edu/LatticeKrig

OTHER PUBLICATIONS

N. Lenssen (2022), "Uncertainty and Predictability of Seasonal-to-Centennial Climate Variability" *Columbia University Doctoral Theses.* DOI: 10.7916/4j9y-yv29

N. Lenssen, L. Goddard, and S. Mason, Y. Kushnir (2022). "Initialized and Uninitialized ENSO Predictability in Year 2." Extended Summary, Climate Prediction S&T Digest, 46th NOAA Climate Diagnostics and Prediction Workshop, Virtual Online, DOC/NOAA, 41-45. DOI: 10.25923/rj6c-rk11

N. Lenssen & National Center for Atmospheric Research Staff (Editors) (2020) "The Climate Data Guide: Global surface temperature data: GISTEMP: NASA Goddard Institute for Space Studies (GISS) Surface Temperature Analysis." https://bit.ly/gistemp_data_guide

L. Goddard, S. Mason, N. Lenssen, T. Dinku, A. Kruczkiewicz (2017), "Evaluation of Ignitia Daily Rainfall Forecasts for Subscribers in West Africa" Report to Securing Water for Food (SWFF) and USAID. https://bit.ly/SWFF_USAID_Report

N. Lenssen (2013), "Applications of Fourier Analysis to Audio Signal Processing: An Investigation of Chord Detection Algorithms" *CMC Senior Theses.* Paper 704. http://scholarship.claremont.edu/cmc_theses/704

N. Lenssen (2013), "Fundamental Limits of Detection in the Near and Mid Infrared" *CMC Senior Theses.* Paper 800. http://scholarship.claremont.edu/cmc_theses/800

CONFERENCE PRESENTATIONS

* indicates presenting author(s)

† indicates student or mentee co-author

N. Lenssen*, G. A. Schmidt, M. Hendrickson, P. Jacobs, M. Menne, R. Ruedy (2023). "A NASA GISTEMP Observational Uncertainty Ensemble: Regional and Monthly Uncertainty" **Presentation** at the AMS Winter Meeting

N. Lenssen*, L. Goddard, P. DiNezio, Y. Kushnir, S. Mason, M. Newman (2023) 'The cost of initialization shock for multi-year ENSO prediction" **Presentation** at the AMS Winter Meeting

N. Lenssen*, G. A. Schmidt, M. Hendrickson, P. Jacobs, M. Menne, R. Ruedy (2022). "A NASA GISTEMP Observational Uncertainty Ensemble: Regional and Monthly Uncertainty" **Presentation** at the AGU Fall Meeting

N. Lenssen*, L. Goddard, P. DiNezio, Y. Kushnir, S. Mason, M. Newman (2022) 'The cost of initialization shock for ENSO prediction" **Poster** at the AGU Fall Meeting

K. Schwarzwald*†, N. Lenssen (2022) "A Complete Assessment of Climate Uncertainty in Projections of Climate Impacts" **Poster** at the AGU Fall Meeting

P. Jacobs*, N. Lenssen, G. A. Schmidt (2022) "Convenient Untruths – How We Underestimate Arctic Warming and How We Can Stop" **Poster** at the AGU Fall Meeting

O. Gandara*†, P. DiNezio, J. Klavans, N. Lenssen (2022) "El Niño Without Continents? **Poster** at the National Diversity in STEM Conference

N. Lenssen*, L. Goddard, Y. Kushnir, S. Mason (2022) "Initialized and Uninitialized ENSO Predictability in Year 2" **Poster** at the Societally-Relevant Multi-Year Climate Predictions Workshop

N. Lenssen, K. Schwarzwald*† (2021) "Uncertainty in Climate Impacts Projections due to Model Internal Variability" **Presentation** at the AGU Fall Meeting

P. Jacobs*, N. Lenssen, G. A. Schmidt, R. A. Rohde (2021) "The Arctic Is Now Warming Four Times As Fast As the Rest of the Globe" **Presentation** at the AGU Fall Meeting

N. Lenssen*, L. Goddard, Y. Kushnir, S. Mason (2021) "Initialized and Uninitialized ENSO Predictability in Year 2" **Poster** at the NOAA Climate Diagnostics and Prediction Workshop

J. Jonas, M. Kelley, N. Lenssen, R. Miller*, L. Nazarenko, C. Orbe*, D. Rind, A. Romanou, G. Russell, G. Schmidt (2021), "Overview of predictability using GISS ModelE" **Invited Presentation** at the US Climate Modeling Summit Workshop

N. Lenssen*, L. Goddard, S. Mason (2020), "Seasonal Forecast Skill of ENSO Teleconnection Maps" **Presentation** at the International Verification Methods Workshop

N. Lenssen*, G. A. Schmidt, J. E. Hansen, et al. (2019), "Improvements in the GISTMP Uncertainty Model" **Presentation** at the AGU Fall Meeting

N. Lenssen*, L. Goddard, S. Mason (2019), "Revisiting the Climatology Reference in Seasonal Forecasting of Precipitation" **Presentation** at the International Meetings on Statistical Climatology

N. Lenssen*, G. A. Schmidt, J. E. Hansen, et al. (2019), "Improvements in the Uncertainty Model in the Goddard Institute for Space Studies Surface Temperature (GISTEMP) Analysis" **Presentation** at the International Meetings on Statistical Climatology

N. Lenssen*, L. Goddard, S. Mason (2018), "Communication of ENSO-Related Precipitation Anomalies to Resource Constrained Decision-Makers" **Poster** at the AGU Fall Meeting

N. Lenssen*, A. Hannart, D. Hammerling (2018), "Tunable Testbed for Detection and Attribution Methods" **Invited Presentation** at the Statistical and Applied Mathematical Sciences Institute (SAMSI) Program on Mathematical and Statistical Methods for Climate and the Earth System (CLIM) Transition Workshop

N. Lenssen*, A. Hannart, D. Hammerling (2018), "Tunable Testbed for Detection and Attribution Methods" **Presentation** at the International Detection and Attribution Group Workshop

D. Hammerling*, N. Lenssen, D. Nychka, S. R. Sain (2014), "NCAR Supercomputing for Multi-Resolution Gaussian Process Modeling" **Invited Poster** at the Joint Statistical Meetings

INVITED SEMINARS

"Large Ensembles for the Projection of Climate Impacts" (November 2022). Climate Analysis Section Seminar at the National Center for Atmospheric Research

"A High-Level Look at Uncertainty in Historical Sea Surface Temperature" (October 2022). Karnauskas Group Seminar

"Importance of Internal Climate Variability in Climate Impact Projections" (September 2022). Kay Group Seminar

"Seasonal Forecast Skill of ENSO Teleconnection Maps" (October 2020). International Research Institute for Climate and Society (IRI) Seminar

"Improvements in the uncertainty model in the Goddard Institute for Space Studies Surface Temperature (GISTEMP) analysis" (June 2019). GISS Lunch Seminar

"Communication of ENSO-Related Precipitation Anomalies to Resource Constrained Decision-Makers" (March 2019). IRI Seminar

"Uncertainty Quantification in Data-Poor Spatial Averaging: An Update to the NASA GISS Surface Temperature Analysis" (April 2017). Applied Math Seminar at the National Center for Atmospheric Research.

ACADEMIC TEACHING EXPERIENCE

Author and Instructor, "Impacts of Climate Change on Humans in NYC" Spring 2022
Columbia University EESC 3114 *New York, NY*

- Self-designed syllabus nominated by the Department of Earth and Environmental Sciences for a Columbia Graduate School of Arts and Sciences fellowship
- Overall student evaluation score 4.92/5.00, $n = 12/13$

Co-Author and Instructor, "Understanding Earth's Climate System" Spring & Fall 2020
Columbia Science Honors Program (High School Students) *New York, NY*

- Designed and taught a 12 week (2.5 hour lessons) high school course on climate science, climate impacts, and climate mitigation and adaptation with Corey Lesk

Teaching Assistant, "Quant. Models of Natural and Human Systems" Fall 2019, 2018
Columbia University EESC 5410 *New York, NY*

- Redeveloped the 10 lab exercises (3 hour lessons) and translated from MATLAB to R with co-TA Corey Lesk

Teaching Assistant, "Introduction to Data Science" Fall 2016
Columbia University STAT 5705 *New York, NY*

Teaching Assistant, "Statistical Inference" Fall 2014
Columbia University STAT 4107 *New York, NY*

Teaching Assistant, Physics Department Fall 2012 - Spring 2013
Claremont McKenna College *Claremont, CA*

Teaching Assistant, Math Department Spring 2010 - Fall 2012
Claremont McKenna College *Claremont, CA*

LECTURE/WORKSHOP TEACHING EXPERIENCE

Co-Author and Instructor, "Workshop on Anti-Racist Pedagogy" January 2021
Columbia University, Department of Earth and Environmental Sciences *New York, NY*

- Developed a 3 hour workshop for students and faculty with 3 other PhD students and the Columbia Center for Teaching and Learning

Instructor, "Workshop on Subseasonal Forecasting" November 2019
SENAHMI Perú (National Meteorological Office) *Lima, Perú*

Co-Author and Instructor, "Computational Methods for Climate Science" August 2017
The Statistical and Applied Mathematical Sciences Institute *Durham, NC*

Instructor, "Beyond P-Values Course: Bayesian Statistics" July 2016
National Center for Atmospheric Research *Boulder, CO*

Co-Author and Instructor, "Supercomputing for Spatial Statistics" September 2015
University of Michigan, Departments of Statistics and Biostatistics *Ann Arbor, MI*

Instructor, "Data Analytics Bootcamp for High School Students" July 2015
National Center for Atmospheric Research *Boulder, CO*

GENERAL AUDIENCE ARTICLES AND VIDEOS

N. Lenssen (2020) "La Niña & Winter Forecasts - Explained" `https://opensnow.com/news/post/la-ni-a-winter-forecasts-explained`

N. Lenssen (2020) "Fold and Forecast" Video for LDEO Open House `https://openhouse.ldeo.columbia.edu/content/fold-and-forecast`

PROFESSIONAL EXPERIENCE

Invited Participant, "STATMOS Workshop for Spatial Statistics" September 2019
University of Iowa *Iowa City, IA*

- Led an activity applying spatial statistics methods to the GHCN observational temperature record

Invited Participant, "CESM Tutorial" August 2018
National Center for Atmospheric Research *Boulder, CO*

Invited Participant, "Summer School on Climate Dynamics" July 2018
International Centre for Theoretical Physics *Trieste, Italy*

- Attended on an NSF travel grant

Organizer, "Transparency Series: Climate Change in Journalism" December 2017
Columbia University *New York, NY*

Invited Participant, "STATMOS/SAMSI Workshop on Climate Statistics" July 2017
National Center for Atmospheric Research *Boulder, CO*

FELLOWSHIPS AND GRANTS

The Center for Science and Society Seed Grants, "NYC Climate Zines" (Co-PI), Spring 2022

Teaching Scholars Fellowship, Columbia University Graduate School of Arts and Sciences, Fall 2021 - Spring 2022.

National Science Foundation Graduate Research Fellow (NSF GRFP), Fall 2014 - Spring 2019.

Dean's Fellowship, Columbia University Department of Earth and Environmental Sciences, Fall 2017 - Summer 2022.

Dean's Fellowship, Columbia University Department of Statistics, Fall 2014 - Winter 2016.

W.M. Keck Fund Summer Research Fellowship, W.M. Keck Science Department, "Fundamental Limits of Detection of Galaxies in the Near and Mid Infrared," Summer 2012.

German Academic Exchange Service (DAAD) Research Internships in Science and Engineering (RISE), Summer 2011.

Bechtel Summer Research Fellowship, W.M. Keck Science Department, "Spatial Distributions of Precipitation Events from Regional Climate Models," Summer 2010.

SCIENCE OUTREACH AND EDUCATION

Co-Leader, Working Group on K–12 Outreach and Education May 2020 - July 2022
International Research Institute for Climate and Society *New York, NY*

- Co-led a group of 10 IRI students, staff, and a graduate research assistant
- More info and K-12 syllabi: `https://iri.columbia.edu/k-12materials/`

Author and Instructor, "How Do We Know the Earth's Temperature?" May 2022
Earth Institute Live K-16 Outreach Series *Palisades, NY*

- More Info and Recording: `https://www.youtube.com/watch?v=MLBXEVCWwg8`

Author and Instructor, "How Do We Know the Earth's Temperature?" October 2021
Earth2Class *Palisades, NY*

- More info: `https://earth2class.org/site/?p=17349`

Author and Instructor, "Climate Basics" July 2021
LDEO Secondary School Field Research Program *Palisades, NY*

Author and Instructor, "Hurricanes and NYC" May 2021
Hamilton Grange Middle School *New York, NY*

Mentor, "Make with Data Outreach Program" October 2020 - January 2021
NYC Public Schools *New York, NY*

Instructor, "Fold and Forecast" October 2020
LDEO Open House *Palisades, NY*
- Recording: `https://openhouse.ldeo.columbia.edu/content/fold-and-forecast`

Judge, "New York City Science and Engineering Fair" March 2018, 2019
City College of New York *New York, NY*

MENTORING

2021 Susannah Eidmann-Hicks (M.A. student)

2021 *Name withheld* (High School student)

2020 Sheri Kusatzky (M.A. student, now Eco Center Program Assistant at The Spence School)

2020 John Richardson (B.A. student)

2018 Laurel DiSera (M.A. student, now Ph.D. student at Columbia University)

2017 Jake Casselman (M.A. student, now Ph.D. student at ETH Zurich)

PROFESSIONAL SERVICE

IRI DEIA Committee member (September 2021- July 2022)

Reviewer for:

- Geophysical Research Letters
- Journal of Geophysical Research: Atmospheres
- Climate Dynamics
- Environmental Data Science
- Journal of the Meteorological Society of Japan
- Artificial Intelligence for the Earth Systems

Member of the American Geophysical Union (AGU), the American Meteorological Society (AMS), and the American Statistical Association (ASA)