



Arianna M. Varuolo-Clarke

NOAA Climate & Global Change Postdoctoral Fellow
University of Colorado, Boulder

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Academic Appointments

University of Colorado

NOAA Climate & Global Change
Postdoctoral Fellow
Advisor: Jennifer E. Kay

Boulder, CO
September 2023 - present

Education

Ph.D. Columbia University

Earth & Environmental Sciences
Dissertation: The mystery of observed and simulated precipitation trends in Southeastern South America since the early 20th century
Advisors: Jason E. Smerdon & A. Park Williams
M.Phil. (2021), M.A. (2020)

New York, NY
2023

M.S. Stony Brook University

Atmospheric Sciences
Thesis: Topographic influences on the North American monsoon
Advisor: Kevin A. Reed

Stony Brook, NY
2018

B.A. Vermont State University, Lyndon

Atmospheric Science
Formerly Lyndon State College (LSC)

Lyndonville, VT
2016

Research Experience

Graduate Research Assistant

Lamont-Doherty Earth Observatory of Columbia University, New York, NY

2018-2023

Graduate Research Assistant

School of Marine and Atmospheric Science, Stony Brook University, Stony Brook, NY

2016-2018

Significant Opportunities in Atmospheric Research and Science (SOARS)

Summers 2014-2017

Undergraduate Research Assistant

Atmospheric Science Department, Lyndon State College, Lyndonville, VT

2013

Peer-Reviewed Publications

[14] In prep. **Varuolo-Clarke AM**, Kay JE, Medeiros, B., Lenssen, N., Mayer, K. Quantifying dynamic contribution to plausible precipitation patterns of change across the North American west.

[13] In prep. **Varuolo-Clarke AM**, Smerdon JE, Williams AP. Jet dynamics do not explain climate model simulations of muted multidecadal summer precipitation trends in Southeastern South America.

- [12] 2024. Balter-Kennedy, A., Schaefer, J.M., Balco, G., Kelly, M.A., Kaplan, M.R., Schwartz, R., Oakley, B., Young, N.E., Hanley, J. and **Varuolo-Clarke, A.M.** The Laurentide Ice Sheet in southern New England and New York during and at the end of the Last Glacial Maximum: a cosmogenic-nuclide chronology. *Climate of the Past*, 20(9), <https://doi.org/10.5194/cp-20-2167-2024>
- [11] 2024. Williams AP, McKinnon KA, Anchukaitis KJ, Gershunov A, **Varuolo-Clarke AM**, Clemesha RES, Liu H. Anthropogenic influence on extreme cool-season precipitation has not yet emerged across the western United States. *JGR–Atmospheres*, <https://doi.org/10.1029/2023JD040537>
- [10] 2024. Rodriguez-Caton, M., Morales, M.S., Rao, M.P., Nixon, T., Vuille, M., Rivera, J.A., Oelkers, R., Christie, D.A., **Varuolo-Clarke, A.M.**, Ferrero, M.E., Magney, T., Daux, V., Villalba, R., Andreu-Hayles, L. A 300-year tree-ring $\delta^{18}\text{O}$ -based precipitation reconstruction for the South American Altiplano highlights decadal hydroclimate teleconnections. *Commun Earth Environ* 5, 269, <https://doi.org/10.1038/s43247-024-01385-9>
- [9] 2024. Williams AP, Anchukaitis KJ, **Varuolo-Clarke AM**. Atmospheric rivers are responsible for cyclicity in Sierra Nevada precipitation. *Journal of Climate*, <https://doi.org/10.1175/JCLI-D-23-0421.1>
- [8] 2023. Rao, MP, Davi, NK, Magney, TS, Andreu-Hayles, L, Baatarbileg, N, Suran, B, **Varuolo-Clarke, AM**, Cook, BI, D'Arrigo, RD, Pederson, N, Odrentsen, L, Rodríguez-Catón, M, Leland, C, Griffin, KL. Rapidly approaching a thermal tolerance tipping point in the Eurasian boreal forest at its southern margins. *Communications Earth & Environment*, <https://doi.org/10.1038/s43247-023-00910-6>
- [7] 2022. Cook, BI, JE Smerdon, ER Cook, AP Williams, KJ Anchukaitis, JS Mankin, K Allen, L Andreu-Hayles, TR Ault, S Belmecheri, S Coats, B Coulthard, B Fosu, P Grierson, D Griffin, DA Herrera, M Ionita, F Lehner, C Leland, K Marvel, MS Morales, V Mishra, J Ngoma, HTT Nguyen, A O'Donnell, J Palmer, MP Rao, M Rodriguez-Caton, R Seager, DW Stahle, S Stevenson, UK Thapa, **AM Varuolo-Clarke**, EK Wise. Megadroughts in the Common Era and the Anthropocene. *Nat. Rev. Earth Environ.*, <https://doi.org/10.1038/s43017-022-00329-1>
- [6] 2022. **Varuolo-Clarke, AM**, Williams, AP, Smerdon, JE, Ting, M., Bishop, DA. Influence of the South American low-level jet on the austral summer precipitation trend in southeastern South America. *Geophysical Research Letters*, <https://doi.org/10.1029/2021GL096409>
- [5] 2022. Williams AP, Livneh B, McKinnon KA, Hansen WD, Mankin JS, Cook BI, Smerdon JE, **Varuolo-Clarke AM**, Bjarke NR, Juang CS, Lettenmaier DP. Growing impact of wildfire on western United States water supply. *Proceedings of the National Academy of Sciences USA*, <https://doi.org/10.1073/pnas.2114069119>
- [4] 2022. Rodriguez-Caton M, Andreu-Hayles L, Daux V, Vuille M, **Varuolo-Clarke AM**, Oelkers R, Christie DA, D'Arrigo R, Morales MS, Palat Rao M, Srur AM, Vimeux F, Villalba R. Hydroclimate and ENSO Variability Recorded by Oxygen Isotopes from Tree Rings in the South American Altiplano. *Geophysical Research Letters*, <https://doi.org/10.1029/2021GL095883>
- [3] 2021. Steiger NJ, Smerdon JE, Williams AP, Seager R, **Varuolo-Clarke AM**. Coupled megadrought risk in North and South America. *Nature Geoscience*, <https://doi.org/10.1038/s41561-021-00819-9>

- [2] 2021. **Varuolo-Clarke AM**, Smerdon JE, Williams AP, Seager R. Gross discrepancies between observed and simulated 20th to 21st-century precipitation trends in Southeastern South America. *Journal of Climate*, 34, 6441-6457, <https://doi.org/10.1175/JCLI-D-20-0746.1>
- [1] 2019. **Varuolo-Clarke, AM**, Reed K A, Medeiros, B. Characterizing the North American Monsoon in the Community Atmosphere Model: Sensitivity to Resolution and Topography. *Journal of Climate*, <https://doi.org/10.1175/JCLI-D-18-0567.1>

Invited Workshops

Aspen Global Change Institute
Future Terrestrial Water Availability
Aspen CO USA

October 20-25, 2024

Presentations (invited)

- 2025** (*upcoming*) Washington State University Vancouver Science Seminar
(*upcoming*) University of Utah Department of Atmospheric Science
- 2024** Aspen Global Change Institute, Aspen CO, USA
- 2023** Florida State University, Tallahassee, FL, Virtual
Geophysical Fluid Dynamics Laboratory, Princeton, NJ, Virtual

Presentations (first author and presenter)

Varuolo-Clarke, A.M., Kay, J.E., Medeiros, B., Chapman, W.E., 2025: **Disentangling Warming and Circulation Influences on Winter Precipitation Using Nudging Experiments**. American Meteorological Society, 105th Annual Meeting, Winter Weather in a Warming World, New Orleans, LA.

Varuolo-Clarke, A.M., Kay, J.E., Medeiros, B. 2024: **Exploring drivers of modeled western North American mid-latitude precipitation change**. American Geophysical Union, Annual Meeting 2024, Dynamics, Variability, Predictability, and Impacts of Regional Precipitation, Washington, DC.

Varuolo-Clarke, A.M., Kay, J.E., Medeiros, B. 2024: **Exploring drivers of modeled mid-latitude precipitation change**. CFMIP-CLIVAR Conference on Clouds, Circulation, and Climate, Chestnut Hill, MA.

Varuolo-Clarke, A.M., Smerdon, J.E., Williams, A.P., 2023: **Jet dynamics do not explain climate model simulations of muted multidecadal summer precipitation trends in southeastern South America**. American Geophysical Union, Annual Meeting 2023, Climate Change, Variability, and Impacts in South America, San Francisco, CA.

Varuolo-Clarke, A.M., Smerdon, J.E., Williams, A.P., 2023: **The mystery of multidecadal precipitation trends in Southeastern South America**. CFMIP-GASS Conference on Clouds, Precipitation, Circulation and Climate Sensitivity, Paris, France.

Varuolo-Clarke, A.M., Smerdon, J.E., Williams, A.P., 2022: **Low-level jet dynamics simulated by CMIP6 models don't account for their muted estimates of 20th-century precipitation trends in Southeastern**

South America. American Geophysical Union, Annual Meeting 2022, Advancing Research on the Hydroclimate of South America and the Caribbean, Chicago, IL.

Varuolo-Clarke, A.M., Williams, A.P., Smerdon, J.E., 2021: **Intensified low-level jet and increased humidity drove nearly half of the large wetting trend in Southeastern South America.** American Geophysical Union, Annual Meeting 2021, Changes and Impacts of Climate Variability in South America, New Orleans, LA.

Varuolo-Clarke, A.M., Smerdon, J.E., Williams, A.P., 2020: **Gross discrepancies between observed and simulated secular precipitation trends over the 20th-21st centuries in Southeastern South America.** American Geophysical Union, Annual Meeting 2020, CMIP6 Climate Model Evaluation, Virtual Meeting.

Varuolo-Clarke, A.M., Smerdon, J.E., Williams, A.P., 2019: **Investigating Opposing 20th-Century Precipitation Trends in Chile and Argentina using Observations and Models.** American Geophysical Union, Annual Meeting 2019, Changes and Impacts of Climate Variability in South America, San Francisco, CA.

Varuolo-Clarke, A.M., Smerdon, J.E., Williams, A.P., 2019: **Quantifying historical and future causes of hydroclimate variability in Chile and Argentina.** PIRE CREATE Annual Meeting, Sao Paulo, Brazil

Varuolo-Clarke, A.M., Reed, K.A., Medeiros, B., 2018: **Topographic Influences on the North American Monsoon.** American Geophysical Union, Annual Meeting 2018, Monsoons: Observations, Subseasonal, Seasonal, and Interannual to Decadal Variability, Forecast, Climate Change, and Extremes, Washington D.C.

Varuolo-Clarke, A.M., Reed, K.A., Medeiros, B., 2018: **Topographic Influences on the North American Monsoon in the Community Atmosphere Model.** WCRP Grand Challenge on Clouds, Circulation and Climate Sensitivity: 2nd Meeting on Monsoons and Tropical Rain Belts, Poster Session, Trieste, Italy.

Varuolo-Clarke, A.M., Reed, K.A., Medeiros, B., 2018: **Topographic Influences on the North American Monsoon in the Community Atmosphere Model.** 23rd Annual CESM Workshop, Poster Session, Boulder, CO.

Varuolo-Clarke, A.M., Medeiros, B., Reed, K.A., 2018: **Investigating the geographic controls of the North American Monsoon in the Community Atmosphere Model.** American Meteorological Society 33rd Conference on Hurricanes and Tropical Meteorology, Monsoon Oral Session, Ponte Vedra, FL.

Varuolo-Clarke, A.M., Medeiros, B., Reed, K.A., 2018: **Investigating the geographic controls of the North American Monsoon in the Community Atmosphere Model.** Northeastern Storm Conference, Oral Session, Saratoga Springs, NY.

Varuolo-Clarke, A.M., Medeiros, B., Reed, K.A., 2017: **Investigating the Influence of Topography on the Dynamics of the North American Monsoon in Climate Model Simulations.** Graduate Climate Conference Poster Session, Woods Hole, MA.

Varuolo-Clarke, A.M., Medeiros, B., Reed, K.A., 2017: **Investigating the Influence of Topography on the Dynamics of the North American Monsoon in Climate Model Simulations.** SOARS Poster Session 2017, Boulder, CO.

Varuolo-Clarke, A.M., Medeiros, B., Reed, K.A., 2017: **Investigating the Influence of Topography on the Dynamics of the North American Monsoon in Climate Model Simulations**. SOARS Colloquium 2017, Boulder, CO.

Varuolo-Clarke, A.M., Medeiros, B., Reed, K.A., 2016: **What are the roles of air-sea coupling and resolution for the Northeast Pacific stratocumulus to cumulus transition in the Community Earth System Model?** American Geophysical Union, Annual Meeting Poster Session 2016, Toward Reducing Systematic Errors in Weather and Climate Models: Evaluation, Understanding, and Improvement, San Francisco, CA.

Varuolo-Clarke, A.M., Medeiros, B., 2016: **What are the roles of air-sea coupling and resolution for the Northeast Pacific stratocumulus to cumulus transition in the Community Earth System Model?** SOARS Poster Session 2016, Boulder, CO.

Varuolo-Clarke, A.M., Medeiros, B., 2015: **Investigating Climate Responses to Large Volcanic Eruptions in an Ensemble of Climate Model Simulations**, Lyndon State College, Northeastern Storm Conference Oral and Poster Sessions 2015, Saratoga Springs, NY.

Varuolo-Clarke, A.M., Medeiros, B., 2015: **Investigating Climate Responses to Large Volcanic Eruptions in an Ensemble of Climate Model Simulations**, American Meteorological Society, Student Conference Poster Session 2015, Phoenix, AZ.

Varuolo-Clarke, A.M., Medeiros, B., 2014: **Investigating Climate Responses to Large Volcanic Eruptions in an Ensemble of Climate Model Simulations**, American Geophysical Union, Annual Meeting Poster Session 2014, Large Initial-Condition Ensemble Simulations for Climate Change Research, San Francisco, CA.

Varuolo-Clarke, A.M., Medeiros, B., 2014: **Investigating Climate Responses to Large Volcanic Eruptions in an Ensemble of Climate Model Simulations**, SOARS Colloquium 2014, Boulder, CO.

Varuolo-Clarke, A.M., Medeiros, B., 2014: **Investigating Climate Responses to Large Volcanic Eruptions in an Ensemble of Climate Model Simulations**, SOARS Poster Session 2014, Boulder, CO.

Peer Reviewer

Journal reviews:

- 1) Climate Dynamics
- 2) Global and Planetary Change
- 3) International Journal of Climatology
- 4) Journal of Climate
- 5) Nature Communications Earth & Environment
- 6) Weather

Teaching Experience

Columbia University, New York, NY

<i>Guest Lecture</i> , LDEO Summer Interns Seminar Series	Summer 2021
<i>Guest Lecture</i> , "Introduction to Atmospheric Chemistry", EESCGU4924	Spring 2021
<i>Teaching Assistant</i> , Introduction to Atmospheric Chemistry, EESCGU4924	Spring 2021
<i>Teaching Assistant</i> , Earth's Environmental Systems: The Climate System, EESC2100	Fall 2019

New York University, New York, NY <i>Guest Lecture, "Topics in Environmental Science: Climate Change"</i>	Summer 2021
Washington State University Upward Bound, Pullman, WA <i>Summer Academy Course Instructor</i>	Summer 2021
University of Maine, Orono, ME <i>Guest Lecture, "Introduction to Glaciology"</i>	Spring 2021
Borough of Manhattan Community College Upward Bound, New York, NY <i>Workshop Facilitator</i>	Spring 2021
Stony Brook University, Stony Brook, NY <i>Guest Lecture, "Extreme Weather", ATM102.1/EST102.1</i>	Fall 2017
<i>Teaching Assistant, "Weather and Climate", ATM102.1/EST102.1</i>	Spring 2017
<i>Teaching Assistant, "Extreme Weather", ATM103.1</i>	Fall 2016

Additional Experience

Pedagogies of Race and Oppression Learning Community Columbia University, New York, NY	Fall 2020
PIRE CREATE Summer School on Paleoclimate Reconstruction from speleothems and tree-ring records University of Sao Paulo, Sao Paulo, Brazil	July 20 – July 26, 2019
Summer School on Theory, Mechanisms and Hierarchical Modelling of Climate Dynamics: Multiple Equilibrium in the Climate System Participant International Center for Theoretical Physics, Trieste, Italy	June 25 – June 30, 2018
AMS Summer Policy Colloquium Participant, Washington, DC	June 3 – June 12, 2018
Juneau Icefield Research Program (JIRP), Juneau, AK Research – Juneau Icefield Research Program: Mass Balance of Taku and Lemon Creek Glaciers; Mentors – Dr. Matthew Beedle, Dr. Shad O’Neel	Summer 2015

Honors & Awards

CFMIP Early Career Award	2024
NOAA Climate & Global Change Postdoctoral Fellowship	2023-2025
PEO Scholar Award Nomination	2021
Columbia University Provost’s Diversity Fellowship	2018-2023
Columbia University’s Dean’s Fellowship	2018-2019
Maze-Landau Graduate Student Travel Award, Stony Brook University	2018

Stony Brook Dean's Scholarship	Fall 2016, Spring 2017
Dr. David L. Ferguson Merit Award	Fall 2016
LSC Alumni Outstanding Senior Award	Spring 2016
LSC Dean's List	Fall 2012, Spring 2013, Fall 2015, Spring 2016
AGU David J. Hoffman Award	September 2014
LSC Presidential Scholarship	2012-2014
LSC Scholar Award	2012-2015
LSC Promise Scholarship	2012-2015
LSC Honors Scholarship	February 2013
LSC Leadership Scholarship	February 2013
LSC T.N. Vail Endowment	February 2013

Professional Affiliations

Lamont Diversity, Equity, Inclusion & Anti-bias Committee Lamont-Doherty Earth Observatory of Columbia University	2021 - 2023
Ocean and Climate Physics Division Seminar Committee Lamont-Doherty Earth Observatory of Columbia University	2021 - 2022
URGE Lamont Pod Organizer Lamont-Doherty Earth Observatory of Columbia University	2021
Climate Data Guide, Board of Advisors (inaugural member) National Center for Atmospheric Research, Boulder CO NSF-funded effort to grow, improve and diversify the Guide	2020 - 2022
The Climate Consensus Northern Vermont University at Lyndon, Lyndonville VT	2020 - 2022
Diversity Co-Chair, Graduate Student Committee Lamont-Doherty Earth Observatory of Columbia University	2020 - 2021
Lamont-Doherty Earth Observatory Open House Volunteer	2018 - 2019
School of Marine and Atmospheric Science Graduate Club Stony Brook, NY	2017 - 2018
Executive Board of Beta Alpha Sigma Zeta Northern Vermont University at Lyndon, Lyndonville VT	2015-2016
Student Conference Planning Committee for National AMS	Feb. 2015 - May 2016

Technical Skills

Models: Community Earth System Model (CESM)
Programming Languages: Python, NCL, Matlab

Operating Systems: Mac, Windows, Linux, Unix

Professional Affiliations

National Association of Black Geoscientists

2021-present

American Geophysical Union

2014-present

American Meteorological Society

2014-present

Earth Science Women's Network

2014-present