Sylvia C. Sullivan

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EDUCATION

Ph.D. | May 2017 | Georgia Institute of Technology
Major: Chemical Engineering, Minor: Earth and Atmospheric Science
Thesis: *Multi-scale modeling of in-cloud ice crystal formation*
Advisor: Athanasios Nenes

B.S. | June 2012 | California Institute of Technology
Major: Chemical Engineering, Minor: Environmental Science

Study Abroad | Fall 2011 | École Polytechnique
Program: Environmental Fluid Mechanics

ACADEMIC EMPLOYMENT

Assistant Professor | Department of Chemical and Environmental Engineering
Courtesy Appointment | Department of Hydrology and Atmospheric Sciences
University of Arizona | January 2022 - present
- elucidating scale interaction in atmospheric phenomena with simulation and experimentation

Young Investigator Fellow | Institute for Meteorology and Climate Research
Karlsruhe Institute of Technology | November 2019 – November 2021
- radiative effects of tropical ice clouds in the ICON convection-resolving model

Postdoctoral Researcher | Earth and Environmental Engineering Department
Columbia University | September 2017 – September 2019
- satellite climatologies of tropical organized convection and collocated meteorology
- precipitation changes from tropical organized convection with El Niño phase

Doctoral Student | School of Chemical and Biomolecular Engineering
Georgia Institute of Technology | August 2012 – May 2017
- adjoint sensitivity analyses of ice nucleation parameterizations in global climate models
- parcel model development for simulation of secondary ice production processes

Visiting Researcher | Institute for Meteorology and Climate Research
Karlsruhe Institute of Technology | January - July 2016
- secondary ice production parameterizations within the COSMO mesoscale weather model

Visiting Researcher | Climate and Radiation Laboratory
Goddard Space Flight Center | February 2015
- adjoint sensitivity and attribution analyses within the GEOS-5 global climate model

Undergraduate Research Fellow | Air Quality Monitoring Laboratory
Gwangju Institute of Technology | June – August 2011
- NO_2 mixing ratio measurements using Differential Optical Absorption spectroscopy

AWARDS and LEADERSHIP

2019-present Lead editor, *Cloud Physics and Dynamics*, AGU Wiley Geophysical Monograph
2020-2021 KIT Young Investigator Group Preparation Fellowship (100,000 € budget)
2020-2021 EGU Co-convener, Atmospheric Ice clouds observations and modelling
2020-2021 European Conference on Non-Linear Optical Spectroscopy (ECONOS), Co-chair
2016 Chemical Engineering Department Ziegler Award for Best Paper
2014-2015 Chemical and Biomolecular Engineering Graduate Research Symposium, Chair
2013-2016 NASA Earth and Space Science Fellowship: Mixed-Phase Cloud Parameterization in Global Climate Models
2012 Georgia Tech Chemical Engineering Excellence Fellowship
2012 NCAA Division III Track and Field, Team Captain
2011 Summer Undergraduate Research Fellowship: Caltech-GIST Exchange Program
2010 Caltech Summer Undergraduate Research Fellowship

TEACHING and MENTORING

2022 Instructor for ATMO/CHEE 469B/569B: Aerosol Physics
2021 Summer placement mentor to Paul Vautravers from the University of Manchester
2021 International High-Performance Computing Summer School, mentor
2017 Coursework: Fundamentals of Teaching and Learning in Higher Education, Teaching Practicum, Course Design for Higher Education in fulfillment of the **Tech to Teaching Certification**
2016 Co-Instructor for Georgia Tech ChBE4300: Chemical Kinetics & Reactor Design
2014 Teaching Assistant for Georgia Tech ChBE3210: Transport Processes II
2013 Teaching Assistant for Georgia Tech ChBE4300: Chemical Kinetics & Reactor Design
2012 Teaching Assistant for Caltech ChE 10: Introduction to Chemical Engineering

DEVELOPMENT and SERVICE

2021 ECMWF Advanced Numerical Methods for Earth System Modelling, participant
2020 Fulbright-Cottrell Junior Faculty Workshop (*postponed*)
2019 Data Analytics for Climate and Earth (DANCE) Workshop, participant
2018 International High-Performance Computing Summer School, participant
2016-present Reviewer for Geophysical Research Letters, Atmospheric Chemistry and Physics, Geoscientific Model Development, Nature Communications, DOE Atmospheric Science Research, and the NSF Physical Meteorology division.
2014 JPL Center for Climate Sciences Summer School, participant
2014-present American Geophysical Union and American Meteorological Society member
2014-2015 Women in Engineering Outreach Ambassador
2013 NCAR Community Earth System Model tutorial, participant
2011 Student Faculty Committee for Chemical Engineering, student representative
2010 Committee on Exchange Programs and Study Abroad, student representative

PUBLICATIONS

1. *S. Sullivan, A. Voigt, C. Rolf, and M. Krämer. Evaluation of simulated upper-tropospheric lower-stratospheric properties over the Asian monsoon region [in preparation for J. Adv. Model Earth Sys.]*

2. *A. Voigt et al. Resolving convection and cloud microphysics impacts on upper-tropospheric cloud properties over the North Atlantic Ocean [in preparation for J. Geophys. Res.]*
3. *S. Sullivan, A. Voigt, A. Miltenberger, C. Rolf, and M. Krämer. A Lagrangian perspective of ice microphysical impact on cloud-radiative heating [under review at J. Adv. Model Earth Sys.]*
4. *L. Gu, J. Yin, P. Gentine, S. Guo, H.-M. Wang, L. J. Slater, S. C. Sullivan, J. Zscheischler, J. Zhou, and J. Chen. Large anomalies in extreme precipitation sensitivity driven by atmospheric dynamics in a warming Earth [under review at Science Advances].*
5. *S. Chakraborty, S. Sullivan, and Z. Feng. An overview of mesoscale convective systems: Observations, modelling, and tropical climate variability (2022) [under review at AGU Geophysical Monographs].*
6. S. Sullivan and C. Hoose. Science of cloud and climate science: An analysis of the literature over the past 50 years (2022). [Accepted in AGU Geophysical Monographs].
7. S. Sullivan and A. Voigt. Ice microphysical processes exert a strong control on the simulated radiative energy budget in the tropics (2021). *Comms. Earth & Env.* **2** (137).
8. J. Yin, S. Guo, P. Gentine, S. Sullivan, L. Gu, S. He, J. Chen, and P. Liu. Does the hook structure constrain future flood intensification under anthropogenic climate warming? (2021). *Water Res. Rev.* **57** (2).
9. S. Bacer, S. Sullivan, O. Sourdeval, H. Tost, J. Lelieveld, and A. Pozzer. Ice microphysical process rates of large-scale clouds in EMAC (2021) *Atm. Chem. Phys.* **21**: 1485-1505.
10. K. Schiro, S. Sullivan, Y.-H. Kuo, H. Su, P. Gentine, G. S. Elsaesser, J. H. Jiang, and J. David Neelin. Environmental controls on tropical mesoscale convective system precipitation intensity (2020) *J. Atm. Sci.* **77** (12): 4233-4249.
11. S. Sullivan, K. Schiro, J. Yin, and P. Gentine. Changes in precipitation extremes from organized convection with El Niño warming (2020). *Geophys. Res. Lett.* **47**: e2020GL087663.
12. G. Sotiropoulou, S. Sullivan, J. Savre, G. Lloyd, T. Lachlan-Cope, A. Ekman, and A. Nenes. The impact of secondary ice production on Arctic stratocumulus (2020). *Atmos. Chem. Phys.* **20**: 1301-1316.
13. L. Gu, J. Yin, J. Chen, S. Guo, S. Sullivan, H.-M. Wang, and C.-Y. Xu. Projected increases in magnitudes and socioeconomic exposures of global droughts in 1.5° and 2°C warmer climates (2019). *Hydrol. Earth Syst. Sci.* **24**: 451-472.
14. S. Sullivan, K. Schiro, C. Stubenrauch, and P. Gentine. The response of convective organization throughout the tropics to El Niño warming (2019). *J. Geophys. Res.* **124**: 8481-8500.
15. S. Sullivan, C. Barthlott, J. Crosier, A. Nenes, and C. Hoose. The effect of secondary ice parameterizations on a simulated frontal rain band (2018). *Atmo. Chem. Phys.* **18**: 16461-16480.
16. J. Yin, P. Gentine, S. Zhou, S. Sullivan, R. Wang, Y. Zhang, and S. Guo. Large increase in storm runoff extremes under anthropogenic changes (2018). *Nature Comm.* **9**: 4389.
17. S. Bacer, S. Sullivan, V. A. Karydis, D. Barahona, A. Nenes, H. Tost, A. P. Tsimpidi, J. Lelieveld, and A. Pozzer. Implementation of a comprehensive ice crystal formation parameterization into the EMAC model (2018). *Geosci. Model Develop.* **11**: 4021-4041.
18. S. Sullivan, C. Hoose, A. Kiselev, T. Leisner, and A. Nenes. Initiation of secondary ice production in clouds (2018). *Atmos. Chem. Phys.* **18**: 1593-1610.

19. S. Sullivan, C. Hoose, and A. Nenes. Investigating the relative contributions of secondary ice formation processes to ice crystal number concentrations (2017). *J. Geophys. Res.* **122** (17): 9391-9412.
20. Field, P. et al. Chapter 7. Secondary Ice Production – current state of the science and recommendations for the future (2016). *Met. Monog.* **58**: 7.1-7.20.
21. S. Sullivan, D. Lee, L. Oreopoulos, and A. Nenes. The role of updraft velocity in temporal variability of cloud hydrometeor number (2016). *Proc. Nat. Acad. Sci.* **113** (21): 5791-5796.
22. S. Sullivan, R. Morales, D. Barahona, and A. Nenes. Understanding cirrus ice crystal number variability for different heterogeneous nucleation spectra (2016). *Atmos. Chem. Phys.* **16**: 2611-2629.
23. B. Sheyko, S. Sullivan, R. Morales, S. L. Capps, D. Barahona, X. Shi, X. Liu, and A. Nenes. Quantifying sensitivities of ice crystal number and sources of ice crystal number variability in CAM 5.1 using the adjoint of a physically-based cirrus formation parameterization (2015). *Journal of Geophysical Research* **120** (7): 2169-8996.

INVITED PRESENTATIONS

1. ***Ice microphysics and tropical atmospheric radiative heating.*** The Swiss Federal Institute of Technology, May 2021
2. ***Ice crystals and convective plumes: The large-scale impacts of local atmospheric phenomena.*** The University of Arizona, March 2021
3. ***From environmental moisture to precipitation intensity in tropical convective systems*.** Laboratoire de Météorologie Dynamique, February 2020
4. ***The role of large-scale circulation and ice microphysics on Mediterranean precipitation extremes*.** Centre National d'Études Spatiales, May 2019
5. ***The relationship of atmospheric ice content and vertical velocities*.** Brookhaven National Laboratory, December 2018
6. ***Multi-scale modeling of in-cloud ice crystal formation*.** Geophysical Fluid Dynamics Laboratory, October 2016
7. ***The role of updraft velocity in temporal variability of cloud hydrometeor number*.** Georgia Tech School of Chemical Engineering, October 2016

SKILLS

Computer: Python, MATLAB, Fortran, LaTeX, bash, git
Language: French – TCF C2 level
German – B2.2 certification (CEFR standards)
Spanish – courses through A2 level

REFERENCES

Prof. Athanasios Nenes, Ecole Polytechnique Fédérale de Lausanne, athanasios.nenes@epfl.ch
Prof. Corinna Hoose, Karlsruhe Institute of Technology, corinna.hoose@kit.edu
Prof. Aiko Voigt, University of Vienna, aiko.voigt@univie.ac.at
Prof. Pierre Gentine, Columbia University, pg2328@columbia.edu
Dr. Lazaros Oreopoulos, Goddard Space Flight Center, lazaros.oraiopoulos-1@nasa.gov