

# Sylvia C. Sullivan

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## EDUCATION

**PH.D. | MAY 2017 | GEORGIA INSTITUTE OF TECHNOLOGY | GPA 3.8/4.0**

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 | GPA 3.4/4.0**

Major: Chemical Engineering, Minor: Environmental Science

## RESEARCH EXPERIENCE

**POSTDOCTORAL RESEARCHER | INSTITUT FÜR METEOROLOGIE UND KLIMAFORSCHUNG  
KARLSRUHER INSTITUT FÜR TECHNOLOGIE | NOVEMBER 2019 – PRESENT**

- radiative effects of tropical anvil cirrus clouds in cloud-resolving models

**POSTDOCTORAL RESEARCHER | EARTH AND ENVIRONMENTAL ENGINEERING DEPARTMENT  
COLUMBIA UNIVERSITY | SEPTEMBER 2017 – SEPTEMBER 2019**

- climatologies of tropical organized convection and collocated meteorology using satellite data
- causal algorithms to study feedbacks of organized convection and large-scale circulation

**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 | INSTITUT FÜR METEOROLOGIE UND KLIMAFORSCHUNG  
KARLSRUHER INSTITUT FÜR TECHNOLOGIE | 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 global-scale Goddard Earth-Observing System Model

**RESEARCH STUDENT | LABORATOIRE D'HYDRODYNAMIQUE  
ÉCOLE POLYTECHNIQUE | SEPTEMBER – DECEMBER 2011**

- modeling of oceanic turbidity currents and stability regime analysis

**UNDERGRADUATE RESEARCH FELLOW | AIR QUALITY MONITORING LABORATORY GWANGJU  
INSTITUTE OF TECHNOLOGY | JUNE – AUGUST 2011**

- NO<sub>2</sub> mixing ratio measurements using Differential Optical Absorption spectroscopy

## PUBLICATIONS

1. S. Bacer, S. Sullivan, H. Tost, J. Lelieveld, and A. Pozzer. *Ice microphysical process rates of large-scale clouds in EMAC (2020) Atm. Chem. Phys. [submitted]*.

2. J. Yin, S. Guo, P. Gentine, L. Gu, S. Sullivan, S. He, and J. Chen. Shifting regulations of storm runoff extremes under anthropogenic climate warming (2020) *Geophys. Res. Lett.* [submitted].
3. 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.* [under revision].
4. S. Sullivan, K. Schiro, J. Yin, and P. Gentine. Changes in precipitation extremes from organized convection with El Niño warming (2020) [resubmitted after revision].
5. 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.
6. 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.
7. 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.
8. 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.
9. 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.
10. 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.
11. 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.
12. 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.
13. 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.
14. 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.
15. 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.
16. 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.

## AWARDS AND DEVELOPMENT

**2019** Data Analytics for Climate and Earth (DANCE) Workshop

**2018** International High-Performance Computing Summer School

**2016** Chemical Engineering Department Ziegler Award for Best Paper

**2013-2016** NASA Earth and Space Science Fellowship: Mixed-Phase Cloud Parameterization in Global Climate Models  
**2014** JPL Center for Climate Sciences Summer School  
**2014** Alternate candidate, Fulbright fellowship  
**2013** NCAR Community Earth System Model tutorial  
**2012** Georgia Tech Chemical Engineering Excellence Fellowship  
**2011** Summer Undergraduate Research Fellowship: Caltech-GIST Exchange Program  
**2010** Caltech Summer Undergraduate Research Fellowship  
**2008** AP National Scholar, National Merit Scholar

## LEADERSHIP AND SERVICE

**2020** Co-covener, EGU 2020 Atmospheric Ice clouds observations and modelling  
**2019-present** Lead editor, *Cloud Physics and Dynamics*, AGU Wiley Geophysical Monographs Series  
**2016-present** Reviewer for Geophysical Research Letters, Atmospheric Chemistry and Physics, Geoscientific Model Development, Nature Communications, the DOE Atmospheric Science Research, and the NSF Physical Meteorology division.  
**2014-present** American Geophysical Union and American Meteorological Society member  
**2014-2015** Women in Engineering Outreach Ambassador  
**2014-2015** Chair of the Chemical and Biomolecular Engineering Graduate Research Symposium  
**2012** NCAA Division III Track and Field, Team Captain  
**2011** Student Faculty Committee for Chemical Engineering, student representative  
**2010** Committee on Exchange Programs and Study Abroad, student representative

## TEACHING

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

## SELECTED PRESENTATIONS

1. S. Sullivan. From environmental moisture to precipitation intensity in tropical convective systems.  
Invited Speaker, Laboratoire de Météorologie Dynamique, February 2020
2. S. Sullivan. The role of large-scale circulation and ice microphysics on Mediterranean precipitation extremes.  
Invited Speaker, Centre National d'Études Spatiales, May 2019
3. S. Sullivan. The relationship of atmospheric ice content and vertical velocities.  
Invited Speaker, Brookhaven National Laboratory, December 2018
4. S. Sullivan, C. Hoose, and A. Nenes. The effect of secondary ice production parameterizations on a simulated cold frontal rainband.  
Convener highlight at the EGU Meeting 2017
5. S. Sullivan. Multi-scale modeling of in-cloud ice crystal formation.  
Invited Speaker, Geophysical Fluid Dynamics Laboratory, October 2016

6. S. Sullivan and A. Nenes. The role of updraft velocity in temporal variability of cloud hydrometeor number.  
Invited Speaker, Georgia Tech School of Chemical Engineering, October 2016

## SKILLS

**Computer:** Python, MATLAB, bash, Fortran, LaTeX

**Language:** French (advanced – TCF C2 level); German (intermediate – GZ B2 level);  
Spanish (advanced elementary – A2 level)

**Athletics:** Middle- and long-distance running, triathlons