

## Research Interests

---

- Cloud-aerosol interactions, cloud feedbacks, boundary layer cloud dynamics, cloud-circulation coupling

## Research Appointments

---

- **Research Physical Scientist** Princeton, NJ  
*NOAA Geophysical Fluid Dynamics Laboratory* *October 2024 - February 2025*
  - Led development of aerosol-cloud interactions scheme in GFDL’s AM5, including updates to couple new 2-moment aerosol physics with new 2-moment cloud physics.
  - Led research constraining and understanding historical aerosol radiative forcing, especially  $ERF_{aci}$ .
  - Developed a Lagrangian microphysics model analog for Princeton Cloud Chamber to investigate homogeneous nucleation of liquid droplets.
- **NOAA C&GC Postdoctoral Fellow** Palisades, NY  
*Columbia University, Lamont-Doherty Earth Observatory* *October 2023 - October 2024*
  - Used satellite and reanalyses (CERES, MODIS, CALIPSO, MISR, ERA5-CAMS, MERRA-2) to investigate recent clear-sky brightening trends over the Southern Ocean.
  - Developed CESM mock-Walker aquaplanet configuration to study low cloud feedback dependence on mean-state zonal atmospheric overturning circulation strength.

## Education

---

- **California Institute of Technology** Pasadena, CA  
*Department of Environmental Science and Engineering* *October 2018 - August 2023*
  - Research advisor: Dr. Tapio Schneider
  - Thesis: “The role of small-scale cloud, aerosol, and radiation processes for Earth’s climate”
- **University of Chicago** Chicago, IL  
*BA Physics, BS Mathematics* *September 2014 - June 2018*
  - Research Advisor: Dr. Liz Moyer
  - Undergraduate thesis: “Comparison of water vapor observations in the Asian Monsoon UTLS region”

## Publications

---

1. **C.E. Singer** and R. Pincus, “Southern Ocean clear-sky brightening caused by wind-driven sea spray aerosol increase.” *Geophysical Research Letters*, In prep.
2. K. Lamb, **C.E. Singer**, K. Loftus, H. Morrison, M. Powell, J. Ko, J. Buch, M. van Lier Walqui, and P. Gentine, “Perspectives on Systematic Machine Learning for Cloud Microphysics.” In prep.
3. B.W. Clouser, C.C. KleinStern, A. Desmoulin, **C.E. Singer**, J. St. Clair, T.F. Hanisco, D.S. Sayres, and E.J. Moyer, “Validation of ACE-FTS  $\delta D$  retrievals with airborne in situ sampling.” *Atmospheric Chemistry and Physics*, In prep.
4. **C.E. Singer**, S. Arabas, and R.X. Ward, “Using laboratory data to inform superdroplet representations of surface-active organics in cloud droplet activation.” *Atmospheric Chemistry and Physics*, In prep.
5. **C.E. Singer** and T. Schneider. “Stratocumulus-cumulus transition explained by bulk boundary layer theory.” *Journal of Climate*, In revision.
6. **C.E. Singer** and T. Schneider. “An analytical perspective on stratocumulus cloud response to CO<sub>2</sub> forcing.” *Journal of Climate*, In revision.

7. B.W. Clouser, L.C. Sarkozy, **C.E. Singer**, C.K. KleinStern, A. Desmoulin, D. Gaeta, S. Khaykin, S. Gabbard, S. Shertz, and E.J. Moyer, “The Airborne Chicago Water Isotope Spectrometer: An Integrated Cavity Output Spectrometer for Measurements of the HDO/H<sub>2</sub>O Isotopic Ratio in the Asian Summer Monsoon.” *Atmospheric Measurement Techniques Discussions*.
8. L.A. Dove, **C.E. Singer**, S.E. Murphy. “Ten steps to make qualifying examinations in geoscience graduate programs more equitable.” *AGU Advances*, 5, e2024AV001260, 2024.
9. G. Feingold, et al. “Community consensus on physical science research needs to evaluate the viability of marine cloud brightening” *Science Advances*, 10(12), eadi8594, 2024.
10. E.K. de Jong\*, **C.E. Singer\***, S. Azimi, O. Bulenok, P. Bartman, K. Derlatka, I. Dula, A. Jaruga, J.B. Mackay, R.X. Ward, and S. Arabas, “PySDM v2: collisional breakup, immersion freezing, dry aerosol initialization, and adaptive time-stepping.” *Journal of Open Source Software*, 8(84), 4968, 2023.
11. K.A. Schiro, H. Sui, F. Ahmed, N. Dai, **C.E. Singer**, P. Gentine, G.S. Elsaesser, J.H. Jiang, Y.-S. Choi, and J.D. Neelin, “Model spread in tropical low cloud feedback tied to overturning circulation response to warming.” *Nature Communications*, 13, 7119, 2022.
12. P. Bartman, O. Bulenok, K. Grski, A. Jaruga, G. Lazarski, M.A. Olesik, B. Piasecki, **C.E. Singer**, A. Talar, and S. Arabas, “PySDM v1: particle-based cloud modeling package for warm-rain microphysics and aqueous chemistry.” *Journal of Open Source Software*, 7(72), 3219, 2022.
13. **C.E. Singer**, B.W. Clouser, S.M. Khaykin, M. Krmer, F. Cairo, T. Peter, A. Lykov, C. Rolf, N. Spelten, A. Afchine, S. Brunamonti, and E.J. Moyer, “Intercomparison of UTLS water vapor measurements over the Asian Summer Monsoon.” *Atmospheric Measurement Techniques*, 15, 4767-4783, 2022.
14. S.M. Khaykin, E.J. Moyer, M. Krmer, B. Clouser, S. Bucci, B. Legras, A. Lykov, A. Afchine, F. Cairo, I. Formanyuk, V. Mitev, R. Matthey, C. Rolf, **C.E. Singer**, N. Spelten, V. Volkov, V. Yushkov, and F. Stroh, “Persistence of moist plumes from overshooting convection in the Asian monsoon anticyclone.” *Atmospheric Chemistry and Physics*, 22, 3169-3189, 2022.
15. **C.E. Singer**, I. Lopez-Gomez, X. Zhang, T. Schneider, “Top-of-atmosphere albedo bias from neglecting three-dimensional cloud radiative effects.” *Journal of Atmospheric Science*, 78(12), 4053-4069, 2021.
16. Y. Ming, N.G. Loeb, P. Lin, Z. Shen, V. Naik, **C.E. Singer**, R.X. Ward, F. Paulot, Z. Zhang, N. Bellouin, L.W. Horowitz, P.A. Ginoux, and V. Ramaswamy, “Assessing the influence of COVID19 on the shortwave radiative fluxes over the East Asian Marginal Seas.” *Geophysical Research Letters*, e2020GL091699, 2020.
17. R. Bernstein, **C.E. Singer**, S.P. Singh, C. Mao, and C.J. Arnusch, “UV initiated surface grafting on polyethersulfone ultrafiltration membranes via ink-jet printing assisted modification.” *Journal of Membrane Science*, 548 (2018).
18. K.A. Murphy, N. Reiser, D. Chosky, **C.E. Singer**, and H.M. Jaeger, “Freestanding loadbearing structures with Z-shaped particles.” *Granular Matter*, 18, 26 (2016).

## Selected Presentations

---

1. “Using laboratory data to inform superdroplet representations of surface-active organics.” **Poster**. Micro2Macro CLIVAR Workshop; Laramie, WY; October 2024.
2. “Earth’s Hemispheric Albedo Symmetry.” **Poster**. CFMIP; Boston, MA; June 2024.
3. “Exploring CO<sub>2</sub>-Induced Stratocumulus Cloud Breakup in CESM.” **Oral & Poster**. Gordon Research Seminar & Conference; Lewiston, ME; July 2023.
4. “Extended mixed-layer theory for the stratocumulus-cumulus transition in climatology and under extreme CO<sub>2</sub> forcing.” **Oral**. CFMIP; Seattle, WA; July 2022.
5. “Successes, Challenges, and Lessons Learned by the Caltech URGE Pod.” **Poster**. AGU 2021 Fall Meeting; New Orleans, LA; December 2021.

6. “Quantifying Cloud Sensitivity to Aerosol Hygroscopicity using a Lagrangian Cloud Model.” **Virtual oral.** ICCP; August 2021.

## Awards

---

<i>Geophysical Research Letters</i> Outstanding Reviewer Award . . . . .	2023
NOAA Climate & Global Change Postdoctoral Fellowship . . . . .	2023-2025
3rd place, DRI’s Wagner Award for Women in Atmospheric Sciences (paper competition) . . . . .	2023
CFMIP Outstanding Early Career Presentation Award . . . . .	2022
Caltech ESE Department (inaugural) Service Award . . . . .	2021
Richard H. Jahns Teaching Award (Caltech GPS Division TA Award) . . . . .	2021
NSF Graduate Research Fellowship . . . . .	2018-2021
John Haeseler Lewis Prize (top UChicago graduating physics major) . . . . .	2018
Barry M. Goldwater Scholarship . . . . .	2017
Astronaut Scholarship . . . . .	2017
David W. Grainger Fellowship (full tuition for top UChicago physics rising senior) . . . . .	2017

## DEIJ Activities

---

- **Diversity, Equity, Inclusion, and Accessibility Committee** GFDL  
*Member* *2024 - 2025*  
 – Member of the GFDL DEIAC. Contributed to GFDL 5-year review question on progress with DEIA at the lab. Participated in development of new recruiting tools for GFDL summer undergraduate research fellowship.
- **Caltech GPS URGE Pod** Caltech  
*Member (2020-2022) and Leader (2022)* *2020 - 2023*  
 – Participant and leader of the Caltech GPS’s Unlearning Racism in the Geoscience Pod. This group participated in the national curriculum for URGE in Jan-June 2020 reading primary literature on structural racism in the geosciences and developing action plans for our own department. From June 2020 until present our Pod has been enacting these plans – working with our division’s DEI committee, Academic Committee, Fieldwork Committee, and the Chair.
- **Society of Women in Physics** UChicago  
*President (2017-2018), Vice President (2016-2017), Board Member (2016)* *2014 - 2018*  
 – Organized and coordinated logistics for events to foster a strong community among students in the physics department. Coordinated SWiPs mentorship program for first year students. Worked with professors and administrative staff to improve communication between undergraduates and faculty. Attended the Conference of Undergraduate Women in Physics (CUWiP) in January 2015 at the University of Michigan and January 2018 at the University of Iowa.

## Professional Service

---

- **Journal reviewer** for *Nature*, *GRL*, *JAS*, *JAMES*, *JGR: Atmospheres*, *ACP*
- **Local Organizer** of CFMIP annual meeting at Boston College (2024)
- **Convener** for AGU Fall Meeting session on “(A)symmetries in Earth’s Climate” (2024)
- **Organizer** of Lamont OCP Seminar (2023-2024)
- **Organizer** of Caltech ESE Department Seminar (2019-2022)
- **Member** of AGU Atmospheric Science Section Early Career Committee; Subcommittee on Resources for Early Career Scientists