

Jianhao Zhang, Ph.D.

 jianhao.zhang@noaa.gov

 01D4MHkAAAAJ

 jianhao.zhang-1@colorado.edu

 [jianhao-zhang-6a6a2881](https://www.linkedin.com/in/jianhao-zhang-6a6a2881)

 [jianhao1991.github.io](https://github.com/jianhao1991)

 0000-0001-6988-2935

Professional Appointment

- | | |
|------------------------|--|
| May 2023 – present |  Research Scientist II , NOAA Chemical Sciences Laboratory & CIRES at the University of Colorado Boulder |
| Sept. 2021 – Apr. 2023 |  Research Scientist I , NOAA Chemical Sciences Laboratory & CIRES at the University of Colorado Boulder |
| Sept. 2020 – Aug. 2021 |  NRC Postdoc fellowship hosted by Graham Feingold at NOAA Chemical Sciences Laboratory |

Education

- | | |
|------|--|
| 2020 |  Ph.D., University of Miami, Miami, FL, USA in Meteorology & Physical Oceanography.
Dissertation title: <i>The interactions between light-absorbing smoke and marine boundary layer clouds over the remote southeast Atlantic.</i>
Committee: Paquita Zuidema (Chair), Brian Mapes, Brian Soden, Cassandra Gaston, David Turner & Takanobu Yamaguchi |
| 2014 |  B.S., Florida State University, Tallahassee, FL, USA in Meteorology.
<i>Magna cum laude; Minor in Mathematics.</i> |

Awards & Honors

-  **Reflective Fellowship, 2025**, Reflective Inc.
-  **National Research Council Research Associateship Fellowship, 2020**, National Academies of Sciences, Engineering, and Medicine
-  **NASA's Group Achievement Awards** (ACTIVATE Team, 2023; ORACLES Team, 2019)
-  **Finalist of University of Miami Best Ph.D. Dissertation, 2020**
-  **University of Miami Graduate Fellowship, 2014** (highest award of the graduate school)

Grants

- | | |
|--------------|--|
| 2025-2026 |  P. I.: A Framework for Assessing SRM Detectability for Informed Decision-Making (Reflective, \$162,768) |
| 2023-2026 |  Co-I.: Aerosol-Cloud Interactions Centered on MAGIC: Insights from Measurements and Lagrangian Large Eddy Simulation (DOE Atmospheric System Research, \$670,445) |
| 2023-2024 |  Co-P.I.: Exploring Aerosol-Cloud Interactions in Geophysical Variable Spaces using NASA-ACTIVATE Observations (NASA Earth Venture Suborbital-3, \$350,000) |
| 2020-2023 |  Co-I.: Evaluating Biases in Aerosol-Cloud Interaction Metrics using ARM Data and Models (DOE Atmospheric System Research, \$510,472) |
| 2020-2021 |  P. I.: National Research Council Fellowship Award (National Academies of Sciences, Engineering, Medicine, \$62,000) |
| 2020-ongoing |  NOAA Earth's Radiation Budget Program (internally funded):
1. Exploring the Susceptibility of Marine Stratocumulus Using Models, Reanalysis, and Satellite-Based Observations.
2. Fundamentals of Aerosol-Cloud Interactions. |

Publications

Peer-reviewed

- 1 J. Zhang, D. Painemal, T. Dror, J.-S. Lim, A. Sorooshian, and G. Feingold, "Inferring processes governing cloud transition during mid-latitude marine cold-air outbreaks from satellite," *EGUsphere*, vol. 2025, pp. 1–29, [under review](#). DOI: [10.5194/egusphere-2025-5119](https://doi.org/10.5194/egusphere-2025-5119).
- 2 G. Feingold, F. Glassmeier, J. Zhang, and F. Hoffmann, "Opinion: Inferring process from snapshots of cloud systems," *Atmospheric Chemistry and Physics*, vol. 25, no. 18, pp. 10 869–10 885, 2025. DOI: [10.5194/acp-25-10869-2025](https://doi.org/10.5194/acp-25-10869-2025).
- 3 J. Zhang, Y.-S. Chen, E. Grisepeerdt, T. Yamaguchi, and G. Feingold, "Radiative forcing from the 2020 shipping fuel regulation is large but hard to detect," *Commun. Earth Environ.*, vol. 6, no. 18, pp. 1–11, 2025. DOI: [10.1038/s43247-024-01911-9](https://doi.org/10.1038/s43247-024-01911-9).
- 4 Y.-S. Chen et al., "Diurnal evolution of non-precipitating marine stratocumuli in a large-eddy simulation ensemble," *Atmos. Chem. Phys.*, vol. 24, no. 22, pp. 12 661–12 685, 2024. DOI: [10.5194/acp-24-12661-2024](https://doi.org/10.5194/acp-24-12661-2024).
- 5 G. Feingold et al., "Physical science research needed to evaluate the viability and risks of marine cloud brightening," *Science Advances*, vol. 10, no. 12, eadi8594, 2024. DOI: [10.1126/sciadv.ad18594](https://doi.org/10.1126/sciadv.ad18594).
- 6 J. Zhang, Y.-S. Chen, T. Yamaguchi, and G. Feingold, "Cloud water adjustments to aerosol perturbations are buffered by solar heating in non-precipitating marine stratocumuli," *Atmos. Chem. Phys.*, vol. 24, no. 18, pp. 10 425–10 440, 2024. DOI: [10.5194/acp-24-10425-2024](https://doi.org/10.5194/acp-24-10425-2024).
- 7 C. Howes et al., "Biomass-burning smoke's properties and its interactions with marine stratocumulus clouds in WRF-CAM5 and southeastern Atlantic field campaigns," *Atmos. Chem. Phys.*, vol. 23, no. 21, pp. 13 911–13 940, 2023. DOI: [10.5194/acp-23-13911-2023](https://doi.org/10.5194/acp-23-13911-2023).
- 8 J. Zhang and G. Feingold, "Distinct regional meteorological influences on low-cloud albedo susceptibility over global marine stratocumulus regions," *Atmos. Chem. Phys.*, vol. 23, no. 2, pp. 1073–1090, 2023. DOI: [10.5194/acp-23-1073-2023](https://doi.org/10.5194/acp-23-1073-2023).
- 9 P. A. Barrett et al., "Intercomparison of airborne and surface-based measurements during the clarify, oracles and lasic field experiments," *Atmos. Meas. Tech.*, vol. 15, no. 21, pp. 6329–6371, 2022. DOI: [10.5194/amt-15-6329-2022](https://doi.org/10.5194/amt-15-6329-2022).
- 10 M. S. Diamond et al., "Cloud adjustments from large-scale smoke–circulation interactions strongly modulate the southeastern atlantic stratocumulus-to-cumulus transition," *Atmos. Chem. Phys.*, vol. 22, no. 18, pp. 12 113–12 151, 2022, [\(ACP highlight\)](#). DOI: [10.5194/acp-22-12113-2022](https://doi.org/10.5194/acp-22-12113-2022).
- 11 J. Zhang, X. Zhou, T. Goren, and G. Feingold, "Albedo susceptibility of northeastern pacific stratocumulus: The role of covarying meteorological conditions," *Atmos. Chem. Phys.*, vol. 22, no. 2, pp. 861–880, 2022. DOI: [10.5194/acp-22-861-2022](https://doi.org/10.5194/acp-22-861-2022).
- 12 J. Zhang and P. Zuidema, "Sunlight-absorbing aerosol amplifies the seasonal cycle in low-cloud fraction over the southeast atlantic," *Atmos. Chem. Phys.*, vol. 21, no. 14, pp. 11 179–11 199, 2021. DOI: [10.5194/acp-21-11179-2021](https://doi.org/10.5194/acp-21-11179-2021).
- 13 X. Zhou, J. Zhang, and G. Feingold, "On the importance of sea surface temperature for aerosol-induced brightening of marine clouds and implications for cloud feedback in a future warmer climate," *Geophys. Res. Lett.*, vol. 48, no. 24, e2021GL095896, 2021. DOI: <https://doi.org/10.1029/2021GL095896>.
- 14 S. J. Abel et al., "Open cells exhibit weaker entrainment of free-tropospheric biomass burning aerosol into the south-east Atlantic boundary layer," *Atmos. Chem. Phys.*, vol. 20, no. 7, pp. 4059–4084, 2020. DOI: [10.5194/acp-20-4059-2020](https://doi.org/10.5194/acp-20-4059-2020).

- 15 J. Zhang and P. Zuidema, "The diurnal cycle of the smoky marine boundary layer observed during August in the remote southeast Atlantic," *Atmos. Chem. Phys.*, vol. 19, no. 23, pp. 14 493–14 516, 2019, (ACP highlight). DOI: 10.5194/acp-19-14493-2019.
- 16 A. S. Chandra, P. Zuidema, S. Krueger, A. Kochanski, S. P. de Szoete, and J. Zhang, "Moisture distributions in tropical cold pools from equatorial Indian ocean observations and cloud-resolving simulations," *J. Geophys. Res. Atmos.*, vol. 123, no. 20, pp. 11, 445–11, 465, 2018. DOI: 10.1029/2018JD028634.
- 17 J. Zhang, P. Zuidema, D. D. Turner, and M. P. Cadeddu, "Surface-based microwave humidity retrievals over the equatorial Indian ocean: Applications and challenges," *J. Appl. Meteor. Climatol.*, vol. 57, no. 8, pp. 1765–1782, 2018. DOI: 10.1175/JAMC-D-17-0301.1.
- 18 P. Zuidema et al., "The Ascension island boundary layer in the remote southeast Atlantic is often smoky," *Geophys. Res. Lett.*, vol. 45, no. 9, pp. 4456–4465, 2018. DOI: 10.1002/2017GL076926.

Other Publications

- 1 J. Zhang and G. Feingold, "Physical Science of Marine Cloud Brightening: Knowledge and Gaps," in *Topical Group on the Physics of Climate*, (invited article), American Physical Society, October 2024, pp. 1–4. URL: <https://engage.aps.org/gpc/resources/newsletters>.
- 2 G. Feingold et al., "DOE-NOAA Marine Cloud Brightening Workshop," in *U.S. Department of Energy and U.S. Department of Commerce NOAA, DOE/SC-0207; NOAA Technical Report OAR ESRL/CSL-1*, 2022, pp. 1–33.

Selected Oral Presentations (2022 -)

- | | |
|-----------|--|
| May 2025 | ■ AGU AS Early-Career Seminar, Online, <i>Global climate and air quality implications of regional emission shift</i> . (invited) |
| Apr. 2025 | ■ Boulder Valley Rotary Club Weekly Meeting, Boulder, CO, USA, <i>How to measure the shade of clouds that are no longer there</i> . (invited) |
| | ■ Climate Dynamics & Impacts, Vecchi/Soden Joint Group Meeting, Princeton University and University of Miami, Online, <i>Large radiative forcing from the 2020 shipping fuel regulation is hard to detect: Implications for Marine Cloud Brightening</i> . (invited) |
| | ■ University of Washington Inaugural MCB Program Workshop, Leavenworth, WA, USA, Session co-lead and presenter, <i>Identifying conditions amenable to cloud brightening/MCB</i> (invited) |
| | ■ NOAA Science Seminar Series, Online, <i>AI Applications in Earth System and Climate Science: Aerosols and Air Quality</i> . (invited) |
| Dec. 2024 | ■ 2024 AGU Fall Meeting, Washington D.C., USA, <i>Large radiative forcing from the 2020 shipping fuel regulation is hard to detect</i> . |
| Nov. 2024 | ■ NOAA Advancing Innovative Research Seminar Series, Online, <i>Large radiative forcing from the 2020 shipping fuel regulation is hard to detect</i> . (invited) |
| Oct. 2024 | ■ Micro2Macro Workshop by US CLIVAR, Laramie, WY, USA, <i>Assessing the non-linear cloud susceptibility to N_d using Machine Learning: differences between GCMs and observation</i> . |
| Jun. 2024 | ■ TU Delft, Delft, Netherlands, <i>On the viability of Marine Cloud Brightening: Albedo susceptibility, cloud adjustment, and detectability</i> . (invited) |
| May 2024 | ■ ACPC Workshop 2024, London & online, UK, <i>Natural variability obscures the detectability of IMO2020's substantial perturbation to cloud radiative effect</i> . |

Selected Oral Presentations (2022 -) (continued)

- Nov. 2023
- **ACTIVATE Science Team Meeting 2023, Tucson, AZ, USA**, *Exploring emergent properties of complex aerosol-cloud-meteorology interactions over the WN Atlantic during ACTIVATE.*
 - **NOAA Earth Radiation Budget Project Meeting, Boulder, CO, USA**, *NOAA Marine Cloud Brightening Satellite Work.*
- Oct. 2023
- **Brookhaven National Laboratory, Long Island, NY, USA**, *Aerosol-cloud interactions in marine warm clouds and implications for Marine Cloud Brightening. (invited)*
- May 2023
- **ACPC Workshop 2023, Houston & online, TX, USA**, *Time-dependent cloud adjustments to aerosol in non-precipitating stratocumulus: diurnal cycle and MCB implications.*
- Dec. 2022
- **2022 AGU Fall Meeting, Chicago, IL, USA**, *On the Conditionality of Marine Low Cloud Albedo Susceptibility: from Meteorological Conditions to Spatiotemporal Scales. (invited)*
- Aug. 2022
- **AMS's 16th Conference on Cloud Physics, Madison, WI, USA**, *Distinct regional fingerprints of marine low cloud albedo susceptibility.*
- May 2022
- **ACPC Workshop 2022, Online**, *Distinct regional meteorological influences on low cloud albedo susceptibility over global marine stratocumulus regions.*
- Jan. 2022
- **2022 AMS Annual Meeting, New Orleans & online, LA, USA**
 1. *Albedo susceptibility of marine stratocumulus: The role of covarying meteorological conditions & its geographical distribution.*
 2. *Amplified seasonal cycle in southeastern Atlantic low cloud fraction when biomass burning smoke is present.*

Teaching, Mentoring & Outreach

- Teaching
- **Aerosol-Cloud-Climate Interactions** as *Guest lecturer*, TU Delft (June 2024)
 - **Introduction to Weather and Climate** as *Teaching Assistant*, University of Miami (2015)
 - **AP calculus and undergrad statistics** as *Math Tutor*, Miami (2015-2020)
- Mentoring
- **Tyler Tatro**, Ph.D. student at University of Miami (2022-present)
 - **Alexander J. Thompson**, Research Scientist at NOAA/PSL (2024-2025)
 - **Danyan Leng**, Ph.D. student at University of Colorado Boulder (2025-present)
 - **Daisy Kerr**, NOAA Hollings Scholar, Physics undergrad at UC Berkeley (incoming 2026)
- Outreach
- **CIRES Science Pathways Program**, CIRES speaker (2025-)
 - **Scientist Panel**, Environmental studies class at Boulder High School (2025)
 - **Panelist**, CIRES Graduate Student Workshop (2025)
 - **Invited Scientist**, Boulder Valley Rotary Club Weekly Discussion (2025)
 - **Evaluator**, Research Experience for Community College Students Symposium 2024; GLOBE International Virtual Science Symposium 2022; Climate Literacy and Energy Awareness Network 2022, AGU Outstanding Student Presentation Award 2020
 - **Science vetting**, Children's book *UP, UP HIGH*

Leadership & Service

- Grant Reviewer
- Department of Energy (DOE) Atmospheric System Research (ASR)
University of Colorado AB Nexus Program
NOAA Hollings Undergraduate Scholarship

Leadership & Service (continued)

Peer Reviewer	Atmospheric Chemistry and Physics (EGU); Communications Earth & Environment, npj Climate and Atmospheric Science (Nature), Science Advances (AAAS), Journal of Geophysical Research: Atmosphere, Journal of Geophysical Research: Machine Learning and Computation, Geophysical Research Letters (AGU); Journal of Climate, Bulletin of the American Meteorology Society, Journal of Applied Meteorology and Climatology (AMS); Climate Dynamics (Springer)
Committee	CIRES Members' Council (2025-present) CIRES Mentoring Program (2024-present, Chair) NOAA OAR subject matter expert in Satellite Data (2022-present) University of Miami RSMAS Student Seminar Committee (2016)
Convener/Lead	Chair , <i>Advances in Assessing Aerosol Impacts on Clouds Through AI and Advanced Statistical Techniques</i> , AMS 2026, Houston, TX, USA Discussion Lead , 2025 Radiation and Climate GRS, Lewiston, ME, USA Session co-Lead , University of Washington Inaugural MCB Workshop, 2025, Leavenworth, WA, USA co-Convenor , <i>Advances in Cloud and Precipitation Processes: Integrating Observations, Modeling, and Theory</i> at the 2024 AGU Fall Meeting, Washington D.C., USA co-Chair , <i>Aerosol-Cloud Indirect Effects</i> at the AMS's 16 th Conference on Cloud Physics, Madison, WI, USA
Trainings	Dialogic Skills Workshop Certificate , University of Colorado Boulder, 2025 Micro2Macro Workshop by US CLIVAR (rapporateur), Laramie, WY, Oct. 2024 DOE-NOAA Marine Cloud Brightening Workshop (rapporateur), Online, Apr. 2022 EarthCare Workshop, Online, Feb. 2022 Aerosol and Clouds-Convection-Precipitation Workshop, Online, Oct. 2020 NCAR Radiation Workshop, Boulder, CO, Mar. 2016 First DOE ARM Summer School, Norman, OK, Jul. 2015
Field campaign	Swakopmund, Namibia, ORACLES-2016 , Sept. 2016 São Tomé, São Tomé and Príncipe, ORACLES-2017 , Aug. 2017
Misc.	Volunteer for CIRES Education & Outreach FSU Intramural Basketball Official (2014)

Media & Press

- Ensuring continuity for atmospheric research, [Link], **Reflective blog post**, 2025
- Flying high in the sky, [Link], **CIRES Spotlights**, 2025
- The unintended consequences of reducing sulfur emissions from ships, [Link], **NOAA CPO News**, 2025
- Scientists turn to artificial intelligence to assess the warming effect of reduced pollution, [Link], **NOAA Research**, 2025
- Scientists turn to artificial intelligence to assess the warming effect of reduced pollution, [Link], **CIRES News**, 2025
- Cleaner Ships, Hotter Earth: The Unexpected Climate Twist, [Link], **SciTechDaily**, 2025
- Shipping emissions reduction sheds light on marine cloud geoengineering, [Link], **Mongabay**, 2024
- Smoke Studies: Crucial Cloud-Deck Science, [Link], **DOE ARM NEWS**, 2021

References

Graham Feingold

Physicist, NOAA Chemical Sciences Laboratory
graham.feingold@noaa.gov

Robert Wood

Professor, University of Washington
robwood2@uw.edu

Paquita Zuidema

Professor, University of Miami
pzuidema@miami.edu

Johannes Mülmenstädt

Earth Scientist, Pacific Northwest National Laboratory
johannes.muelmenstaedt@pnnl.gov