

Feng ZHU

HOME PAGE: <https://fzhu2e.github.io> | PROFILE: [Google Scholar](#) | EMAIL: fengzhu@ucar.edu

Earth System Modeling | Data Assimilation | Machine Learning | Scientific Software Engineering

EDUCATION

AUG 2016 — AUG 2021	Ph.D. Earth Sciences <i>Advisor: Julien Emile-Geay</i>	University of Southern California (USC)
AUG 2014 — MAY 2016	M.S. Atmospheric & Oceanic Sciences <i>Advisor: Steven Ackerman</i>	University of Wisconsin-Madison (UW-Madison)
SEP 2012 — JUN 2014	M.S. Meteorology <i>Advisor: Guoqiang Xu</i>	Chinese Academy of Meteorological Sciences (CAMS)
SEP 2008 — JUN 2012	B.S. Atmospheric Science	Nanjing University of Information Sci. & Tech. (NUIST)

WORK EXPERIENCE

MAY 2024 — PRESENT	Paleoclimate Software Engineer II , NSF National Center for Atmospheric Research <i>Paleoclimate Modeling and Online Data Assimilation, Earth System Model Diagnostics</i>
FEB 2023 — MAY 2024	Paleo & Polar Climate Postdoc Fellow , NSF National Center for Atmospheric Research <i>Miocene Climate Change, Paleoclimate Data Assimilation</i>
SEP 2021 — FEB 2023	Assistant Professor , School of Atmospheric Sciences, NUIST <i>Nonlinear Paleoclimate Data Assimilation</i>
SEP 2020 — AUG 2021	Research Assistant funded by National Oceanic and Atmospheric Administration (NOAA) <i>A Paleoclimate Reconstruction Storehouse to Broaden Access and Accelerate Scientific Inference</i>
SUMMER 2019	Research Assistant funded by Information Sciences Institute of USC <i>autoTS: Automated Machine Learning for Time Series Analysis</i>
SEP 2017 — AUG 2020	Research Assistant funded by NOAA <i>The Global Climate Response to Volcanic Eruptions in the Last Millennium Reanalysis</i>
AUG 2016 — AUG 2017	Graduate Student Fellow funded by USC Dornsife College <i>A Global Multiproxy Database for Temperature Reconstructions of the Common Era</i>
AUG 2014 — MAY 2016	Research Assistant funded by Cooperative Institute for Meteorological Satellite Studies <i>Satellite Data Assimilation for Tropical Storms</i>

FUNDING HISTORY

- [4] *Emulating Water Isotopes in Fully-coupled Global Climate Models using Knowledge-guided Machine Learning*
NSF, Collaborations in Artificial Intelligence and Geosciences (CAIG), **Led the Proposal**, 10/1/2025 - 9/30/2028
- [3] *Enhancing Safety, Security, and Privacy in the Community Earth System Model (CESM) Ecosystem*
NSF, Safety, Security, and Privacy of Open-Source Ecosystems (Safe-OSE), **Co-led the Proposal**, 1/1/2026 - 12/31/2027
- [2] *deepGreen: A deep learning based tree-ring width data model for paleoclimatic data assimilation*
NSF, Paleo Perspectives on Present and Projected Climate (P4CLIMATE), **Led the Proposal**, 7/1/2023 - 6/30/2026
- [1] *x4c: Xarray for efficient CESM postprocessing, analysis, and visualization*
NCAR/CGD Strategic Initiative Fund (SIF), **PI**, 1/1/2025 - 9/30/2025

- [15] **Zhu, F.**, Zhu, J., Si, W., Nirenberg, J.E., Herbert, T., Tierney, J.E., Acosta, R.P., Burls, N.J., Evans, D., **2025**. Model-data synthesis of benthic isotopes suggests a warmer Miocene Climatic Optimum. *Nature Communications* (IF: 17.694). *In Revision*. [Preprint](#)
- [14] Evans, M.N., Lücke, L.J., Fan, K.J., **Zhu, F.**, **2025**. A database of databases for Common Era paleoclimate applications. *Earth System Science Data* (IF: 11.6). *In Revision*. [Preprint](#)
- [13] Nsengi, J.M., Cui, Y., Cepin, E., Beaty, B., Planavsky, N., Wu, Q., Adloff, M., Wang, J., Selby, D., Liu, Z., Dong, Y., Jiang, S., **Zhu, F.**, **2025**. Changes in continental weathering across the Permian-Triassic transition: A global review. *Global and Planetary Change* (IF: 4.0). [doi:10.1016/j.gloplacha.2025.105015](https://doi.org/10.1016/j.gloplacha.2025.105015)
- [12] Luo, J., Hu, J., **Zhu, F.**, Liang, R., Zhou, Z., **2025**. The unstable East Asian Summer Monsoon - ENSO relationship over the past 700 years. *Global and Planetary Change* (IF: 4.0). [doi:10.1016/j.gloplacha.2025.104842](https://doi.org/10.1016/j.gloplacha.2025.104842)
- [11] Emile-Geay, J., Hakim, G.J., Viens, F., **Zhu, F.**, Amrhein, D.E., **2025**. Temporal Comparisons Involving Paleoclimate Data Assimilation: Challenges & Remedies. *Journal of Climate* (IF: 5.38). [doi:10.1175/JCLI-D-24-0101.1](https://doi.org/10.1175/JCLI-D-24-0101.1).
- [10] **Zhu, F.**, Emile-Geay, J., Hakim, G.J., Khider, D., Tardif, R., Perkins, W.A., **2024**. cfr (v2024.1.26): a Python package for climate field reconstruction. *Geoscientific Model Development* (IF: 6.892). [doi:10.5194/gmd-17-3409-2024](https://doi.org/10.5194/gmd-17-3409-2024).
- [9] **Zhu, F.**, Emile-Geay, J., Anchukaitis, K.J., McKay, N.P., Stevenson, S., Meng, Z., **2023**. A pseudoproxy emulation of the PAGES 2k database using a hierarchy of proxy system models. *Scientific Data* (IF: 8.501). [doi:10.1038/s41597-023-02489-1](https://doi.org/10.1038/s41597-023-02489-1).
- [8] Khider, D., Emile-Geay, J., **Zhu, F.**, James, A., Landers, J., Ratnakar, V., Gil, Y., **2022**. Pyleoclim: Paleoclimate Timeseries Analysis and Visualization with Python. *Paleoceanography and Paleoclimatology* (IF: 2.89). [doi:10.1029/2022PA004509](https://doi.org/10.1029/2022PA004509).
- [7] **Zhu, F.**, Emile-Geay, J., Anchukaitis, K.J., Hakim, G.J., Wittenberg, A., Morales, M., King, J., **2022**. A re-appraisal of the ENSO response to volcanism with paleoclimate data assimilation. *Nature Communications* (IF: 17.694). [doi:10.1038/s41467-022-28210-1](https://doi.org/10.1038/s41467-022-28210-1).
- [6] Power, S., Lengaigne, M., Capotondi, A., Khodri, M., Vialard, J., Jebri, B., Guilyardi, E., McGregor, S., Kug, J.S., Newman, M., McPhaden, M.J., Meehl, G., Smith, D., Cole, J., Emile-Geay, J., Vimont, D., Wittenberg, A.T., Collins, M., Kim, G.-I., Cai, W., Okumura, Y., Chung, C., Cobb, K.M., Delage, F., Planton, Y.Y., Levine, A., **Zhu, F.**, Sprintall, J., Di Lorenzo, E., Zhang, X., Luo, J.-J., Lin, X., Balmaseda, M., Wang, G., Henley, B.J., **2021**. Decadal climate variability in the tropical Pacific: Characteristics, causes, predictability, and prospects. *Science* (IF: 63.714). [doi:10.1126/science.aay9165](https://doi.org/10.1126/science.aay9165).
- [5] King, J.M., Anchukaitis, K.J., Tierney, J.E., Hakim, G.J., Emile-Geay, J., **Zhu, F.**, Wilson, R., **2021**. A data assimilation approach to last millennium temperature field reconstruction using a limited high-sensitivity proxy network. *Journal of Climate* (IF: 5.38). [doi:10.1175/JCLI-D-20-0661.1](https://doi.org/10.1175/JCLI-D-20-0661.1).
- [4] **Zhu, F.**, Emile-Geay, J., Hakim, G.J., King, J., Anchukaitis, K.J., **2020**. Resolving the differences in the simulated and reconstructed climate response to volcanism over the last millennium. *Geophysical Research Letters* (IF: 5.576). [doi:10.1029/2019GL086908](https://doi.org/10.1029/2019GL086908).
- [3] **Zhu, F.**, Emile-Geay, J., McKay, N.P., Hakim, G.J., Khider, D., Ault, T.R., Steig, E.J., Dee, S., Kirchner, J.W., **2019**. Climate models can correctly simulate the continuum of global-average temperature variability. *Proceedings of the National Academy of Science* (IF: 12.779). [doi:10.1073/pnas.1809959116](https://doi.org/10.1073/pnas.1809959116).
- [2] PAGES 2k Consortium (Neukom, R., Barboza, L.A., Erb, M.P., Shi, F., Emile-Geay, J., Evans, M.N., Franke, J., Kaufman, D.S., Lücke, L., Rehfeld, K., Schurer, A., **Zhu, F.**, Brönnimann, S., Hakim, G.J., Henley, B.J., Ljungqvist, F.C., McKay, N., Valler, V., von Gunten, L.), **2019**. Consistent multidecadal variability in global temperature reconstructions and simulations over the Common Era. *Nature Geoscience* (IF: 21.531). [doi:10.1038/s41561-019-0400-0](https://doi.org/10.1038/s41561-019-0400-0).
- [1] **Zhu, F.**, Xu, G., Zheng, X., Wang, Y., **2015**. Superparameterization in GRAPES: the construction of SP-GRAPES and associated preliminary results. *Journal of Meteorological Research* (IF: 2.569). [doi:10.1007/s13351-015-4074-2](https://doi.org/10.1007/s13351-015-4074-2).

PUBLICATIONS - BOOK CHAPTER

- [1] Julien Emile-Geay, Kim M. Cobb, Julia E. Cole, Mary Elliot, and **Feng Zhu**, 2020: Past ENSO Variability: Observations, Models, and Implications. In *El Niño and Southern Oscillation in A Changing Climate*, Book Chapter 5. *American Geophysical Union*. doi:10.1002/9781119548164.ch5.

REVIEWS - RESEARCH PROPOSAL

- [1] **ERC Consolidator Grant (up to 3 million EUR)**. European Research Council (ERC). Aug 2023.

REVIEWS - JOURNAL ARTICLE

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| [34] <i>Journal of Climate</i> (IF: 5.38). Oct 2025. | [17] <i>Geophysical Research Letters</i> (IF: 5.76). Aug 2023. |
| [33] <i>Journal of Climate</i> (IF: 5.38). May 2025. | [16] <i>Geophysical Research Letters</i> (IF: 5.76). Jul 2023. |
| [32] <i>Geosci. Model Development</i> (IF: 6.892). May 2025. | [15] <i>JGR: Atmosphere</i> (IF: 4.4). May 2023. |
| [31] <i>Comms Earth & Environment</i> (IF: 8.4). May 2025. | [14] <i>Geo-spatial Information Science</i> (IF: 4.278). Apr 2023. |
| [30] <i>Geosci. Model Development</i> (IF: 6.892). Feb 2025. | [13] <i>Climatic Change</i> (IF: 4.743). Jan 2023. |
| [29] <i>Nature</i> (IF: 69.504). Jan 2025. | [12] <i>Science Advances</i> (IF: 14.136). Dec 2022. |
| [28] <i>Geosci. Model Development</i> (IF: 6.892). Aug 2024. | [11] <i>Atmosphere</i> (IF: 3.11). Dec 2022. |
| [27] <i>Nature</i> (IF: 69.504). Jul 2024. | [10] <i>Atmosphere</i> (IF: 3.11). Aug 2022. |
| [26] <i>J. Adv. Modeling Earth Systems</i> (IF: 6.660). Jun 2024. | [9] <i>Nature Communications</i> (IF: 17.694). Mar 2022. |
| [25] <i>Geosci. Model Development</i> (IF: 6.892). Jun 2024. | [8] <i>Climate of the Past</i> (IF: 4.295). Jan 2022. |
| [24] <i>Geosci. Model Development</i> (IF: 6.892). Apr 2024. | [7] <i>Nature Communications</i> (IF: 17.694). Jan 2022. |
| [23] <i>JGR: Atmosphere</i> (IF: 4.4). Apr 2024. | [6] <i>Nature</i> (IF: 69.504). Nov 2021. |
| [22] <i>Geophysical Research Letters</i> (IF: 5.76). Apr 2024. | [5] <i>Nature</i> (IF: 69.504). Nov 2021. |
| [21] <i>Nature</i> (IF: 69.504). Jan 2024. | [4] <i>The Holocene</i> (IF: 2.595). May 2021. |
| [20] <i>Nature</i> (IF: 69.504). Jan 2024. | [3] <i>Climatic Change</i> (IF: 4.743). Feb. 2021. |
| [19] <i>Geosci. Model Development</i> (IF: 6.892). Dec 2023. | [2] <i>Climate of the Past</i> (IF: 4.295). Feb 2021. |
| [18] <i>Climate Dynamics</i> (IF: 4.6). Oct 2023. | [1] <i>Nature</i> (IF: 69.504). Aug 2020. |

REVIEWS - BOOK

- [1] *Thunder & Lightning: Weather Past, Present, Future (Chinese version)*. Author: Lauren Redniss.
Translator: Yuanbao Luo. May 2022. *Post Wave Publishing*. ISBN: 9787559659699.

OTHER PROFESSIONAL SERVICES

- [4] **Convener**: AGU Session - CyberPaleo: Informatics Approaches to the Paleogeosciences. Dec 2023.
- [3] **Lab Session Assistant**: The Community Earth System Model (CESM) Tutorial 2023. Jul 2023.
- [2] **Judge**: Colorado-Wyoming Junior Academy of Science (CWJAS) Annual Science Symposium. Apr 2023.
- [1] **M.S. Thesis Committee**: Fujian Normal University. May 2022.

RESEARCH SUPERVISION

Senior Thesis Chang Wang (2022). *A Machine Learning Based Simulation Study of Ice Core Oxygen Isotope Data*.

TEACHING EXPERIENCE

SPRING 2022	Assistant Professor , School of Atmospheric Sciences, NUIST <i>Linux and Python for Meteorology (121 students/session, 1 session)</i>
FALL 2018	Teaching Assistant funded by USC Dornsife College <i>GEOL 150: Climate Change (15 students/session, 3 sessions)</i>
SPRING 2018	Teaching Assistant funded by USC Dornsife College <i>GEOL 107: Oceanography (15 students/session, 3 sessions)</i>
SPRING 2017	Teaching Assistant funded by USC Dornsife College <i>GEOL 150: Climate Change (20 students/session, 2 sessions)</i>

ACADEMIC PRESENTATIONS

- [29] **CESM Workshop 2025**. Boulder, CO: *Advancing Deep-Time Climate Reconstruction with a New Online Paleoclimate Data Assimilation Approach in CESM*. **Talk**. Jun 2025.
- [28] **CESM Paleoclimate Working Group Workshop 2025**. Boulder, CO: *Bridging the Miocene Climatic Optimum warmth gap with equilibrated isotope-enabled CESM simulations*. **Talk**. Jan 2025.
- [27] **AGU Fall Meeting 2024**. Washington, D.C.: *Bridging the Miocene Climatic Optimum warmth gap with equilibrated isotope-enabled CESM simulations*. **Talk**. Dec 2024.
- [26] **UConn Workshop on “Climate evolution from early Eocene to mid-Pliocene: insights from proxy data and climate models”**. Storrs, CT: *Revisiting Miocene Climatic Optimum with equilibrated isotope-enabled CESM simulations*. **Talk**. Oct 2024.
- [25] **CESM Workshop 2024**. Boulder, CO: *Revisiting Miocene Climatic Optimum with a unique equilibrated iCESM simulation*. **Talk**. Jun 2024.
- [24] **CESM Workshop 2024**. Boulder, CO: *x4c: Xarray for CESM*. **Poster**. Jun 2024.
- [23] **CESM Workshop 2024**. Boulder, CO: *cfr: a Python package for climate field reconstruction*. **Poster**. Jun 2024.
- [22] **Department Seminar at Woods Hole Oceanographic Institution**. Online: *Paleoclimate Data Assimilation: from the Last Millennium to the Deep Time*. **Invited Talk**. Jun 2024.
- [21] **Miocene Climate Workshop**. Tucson, AZ: *Revisiting Miocene Climatic Optimum with Paleoclimate Data Assimilation*. **Poster**. Mar 2024.
- [20] **AGU Fall Meeting 2023**. San Francisco, CA: *cfr: a Python package for climate field reconstruction*. **Poster**. Dec 2023.
- [19] **World Climate Research Programme (WCRP) Open Science Conference**. Kigali, Rwanda: *cfr: a Python package for climate field reconstruction*. **Poster**. Oct 2023.
- [18] **Building Upon the EarthCube community workshop**. Los Angeles, CA: *cfr: a Python package for climate field reconstruction*. **Poster**. Jun 2023.
- [17] **CESM Workshop 2023**. Boulder, CO: *Volcanism and ENSO: a re-appraisal with paleoclimate data assimilation*. **Talk**. Jun 2023.
- [16] **CESM Workshop 2023**. Boulder, CO: *cfr: a Python package for climate field reconstruction*. **Poster**. Jun 2023.
- [15] **The 8th Geosciences Youth Forum**. Online: *Volcanism and ENSO: a re-appraisal with paleoclimate data assimilation*. **Invited Talk**. May 2023.
- [14] **The 308th Shuangqing Forum**. Online: *Advances in paleoclimate data assimilation*. **Talk**. Apr 2022.
- [13] **Department Seminar at Nanjing University**. Online: *Advances in paleoclimate data assimilation*. **Invited Talk**. Mar 2022.
- [12] **PMIP 2020 Conference**. Online: *Resolving the differences in the simulated and reconstructed temperature response to volcanism over the Last Millennium Reanalysis*. **e-Lightening**. Oct 2020.

- [11] **Graduate Climate Conference.** Online: *Resolving the differences in the simulated and reconstructed temperature response to volcanism over the Last Millennium Reanalysis.* **Poster.** Oct 2020.
- [10] **EGU General Assembly 2020.** Online: *Resolving the differences in the simulated and reconstructed temperature response to volcanism over the Last Millennium Reanalysis.* **Online Discussion.** May 2020.
- [9] **AGU Fall Meeting 2019.** San Francisco, CA: *The climate response to Common Era volcanism: insights from the Last Millennium Reanalysis.* **Talk.** Dec 2019.
- [8] **CLIVAR Water Isotopes and Climate Workshop.** Boulder, CO: *Direct assimilation of water isotope observations in the Last Millennium Reanalysis.* **Poster.** Oct 2019.
- [7] **Data Assimilation, Reanalyses and Proxy System Modeling in Paleoenvironmental Science 2nd Workshop.** College Park, MD: *PAGES2k pseudoproxy emulations.* **Talk.** May 2019.
- [6] **Climate Variability across Scales (CVAS) 3rd Workshop.** Seattle, WA: *Do climate models underestimate the global temperature variability?* **Talk.** Jan 2019.
- [5] **AGU Fall Meeting 2018.** Washington, DC: *Can climate models correctly simulate the continuum of temperature variability?* **Talk.** Dec 2018.
- [4] **Urbino Summer School in Paleoclimatology.** Urbino, Italy: *Do climate models underestimate the global temperature variability?* **Poster.** Jul 2018.
- [3] **AGU Fall Meeting 2017.** New Orleans, LA: *Bridging the spectral divide: a case study with PAGES2k, the CESM Last Millennium Ensemble, and proxy system models.* **Poster.** Dec 2017.
- [2] **Third Annual LMR Workshop.** Boulder, CO: *Bridging the spectral divide: a case study with PAGES2k, the CESM Last Millennium Ensemble, and proxy system models.* **Poster.** Oct 2017.
- [1] **Joint Center of Satellite Data Assimilation Summer Colloquium.** Fort Collins, CO: *Why it is theoretically possible that an improved initial condition can degrade the forecast in fraternal-twin OSSEs?* **Talk.** Jul 2015.

AWARDS

- Early Career Scholarship.** The openDendro Bootcamp. Jan 2024.
- Early Career Researcher Travel Award.** WCRP Open Science Conference. Oct 2023.
- Early Career Researcher Travel Award.** Building Upon the EarthCube community workshop. Jun 2023.
- Graduate Student Travel Award.** CLIVAR Water Isotopes and Climate Workshop. Oct 2019.
- Graduate Student Travel Award.** Data Assimilation, Reanalyses and Proxy System Modeling in Paleoenvironmental Science 2nd Workshop. May 2019.
- Graduate Student Travel Award.** Urbino Summer School in Paleoclimatology. Jul 2018.
- Graduate Student Fellowship.** University of Southern California. Aug 2016.
- Graduate Student Travel Award.** Joint Center of Satellite Data Assimilation Summer Colloquium. Jul 2015.