Xiaojie Gao (高孝杰)

Postdoctoral Researcher
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Personal Website; GitHub; Google Scholar

A remote sensing scientist and global change ecologist who:

- is broadly interested in advanced **remote sensing** and **computational technology** to understand **global vegetation dynamics** and their interactions with **biogeochemical cycles**.
- improves **natural-based solutions** to mitigate future **climate change**.
- strongly advocates for **open science**.

Professional Appointments

2023-present **Harvard University, USA**
Harvard Forest
Postdoctoral Researcher
Advisor: Jonathan R. Thompson

2019-2023 **North Carolina State University, USA**
Center for Geospatial Analytics
Graduate Research Assistant
Advisor: Josh M. Gray

2016-2019 **National Administration of Surveying, Mapping, and Geoinformation, China**
Geospatial Engineer

2014-2016 **Chinese Academy of Sciences**
Institute of Remote Sensing and Digital Earth
Graduate Research Assistant

Education

2019-2023 **North Carolina State University**
Ph.D. in Geospatial Analytics
NASA Future Investigator in Earth and Space Science and Technology (FINESST)
Advisor: Josh M. Gray
Dissertation: Does chilling explain the divergent response of spring phenology to urban heat islands?

2014-2016 **Chinese Academy of Sciences**
Institute of Remote Sensing and Digital Earth
Joint Graduate Student in Hyperspectral Remote Sensing
Advisor: Lifu Zhang, Yi Cen

2013-2016 **Chengdu University of Technology**
M.E. in Remote Sensing for Natural Resources and Environment
Advisor: Ji Jian

2009-2013 **Chengdu University of Technology**
B.S., Geography Information System

Publications

"" indicates my corresponding author role when I was not the first author.*

In Review/Revision

- **Gao, X.**, Stonebrook, S. Green, T., Moon, M. Friedl, M. A. Cross-Scalar Analysis of Multisensor Land Surface Phenology. *Remote Sensing of Environment*. (Preprint available)
- **Gao, X.**, Zhou, Z., Ollinger, S. V., Matthes, J. H., Jiao, W., Thompson, J. R. pnetr: An R package for the PnET family of forest ecosystem models. *Methods in Ecology and Evolution*. (Preprint available)
- Shisler, P.M., Reich, B.J., Schliep, E.M., **Gao, X.**, Gray, J.M. Spatiotemporal Analysis of Land Surface Plant Phenology. *Journal of Agricultural, Biological, and Environmental Statistics*.
- Green, T. W., Moon, M., Gray J., **Gao, X.**, Friedl, M. A. Spatial and Temporal Covariance in Land Surface Phenology, Local Meteorology, and Annual Gross Primary Productivity. *Agricultural and Forest Meteorology*.
- Song, Y., Aldy, J.E., Holbrook, N.M., **Gao, X.**, Thompson, J.R. Entry Choices and Performance of Forest-Based Carbon Offset Projects in Regulatory and Voluntary Carbon Markets. *Journal of the Association of Environmental and Resource Economists*.
- Chen, J., **Gao, X.**, Xu, X., Zhu, C., She, X., Kong, D., Xue, K., Li, Y. Algal Blooms in Lake Taihu: Earlier Onset and Extended Duration. *Global Change Biology.*

In Preparation

- **Gao, X.**, Friedl, M., Reich, B., Terando, A., Tulbure, M., Thompson, J. R., Gray, J. M. Chilling will not constrain spring phenology advancement under near-future warming conditions. *Draft available upon request.*
- Hou, L., **Gao, X.***, Wang, J., Cen, Y.*. Extending Long-Term Vegetation Productivity Dynamics Using Remotely Sensed Phenology derived from Landsat Observations. *Draft available upon request*.
- **Gao, X.**, Friedl, M., Richardson, A. D., Thompson, J. R. Autumn phenology dominates the dynamics of growing season length in Northeastern U.S. forests. *Results available upon request*.
- **Gao, X.**, Friedl, M., Pasquarella, V., Thompson, J. R. The relationship between leaf phenology and forest long-term carbon storage: four decades of phenology and forest inventory analysis. *Results available upon request*.
- **Gao, X.**, Pasquarella, V., Brown, C., Thompson, J. R. Mapping community-constrained tree species at 10-m resolution by deep learning and forest inventory analysis. *Results available upon request*.

Published

- Zhu, C., She, X., **Gao, X.***, Huang, Y., Zeng, Y., Ding, C., Fu, D., Shao, J., Li, Y*. (2024). Spatiotemporal variation of spring phenology and the corresponding scale effects and uncertainties: A case study in southwestern China. *International Journal of Applied Earth Observation and Geoinformation*, 135, 104294.
- **Gao, X.**, Richardson, A. D., Friedl, M. A., Moon, M., Gray, J. M. (2024). Thermal Forcing Versus Chilling? Misspecification of Temperature Controls in Spring Phenology Models. *Global Ecology and Biogeography*, 33(12), e13932.
- **Gao, X.**, McGregor, I.R., Gray, J.M., Friedl, M.A., Moon, M. (2023). Observations of satellite land surface phenology indicate that maximum leaf greenness is more associated with global vegetation productivity than growing season length. *Global Biogeochemical Cycles*, 37(3), e2022GB007462.
- Liu, K., Li, X., Wang, S., **Gao, X.** (2022). Assessing the effects of urban green landscape on urban thermal environment dynamic in a semiarid city by integrated use of airborne data, satellite imagery and land surface model. *International Journal of Applied Earth Observation and Geoinformation*, 107,

102674.

- Bo, Y., Li, X., Liu, K., Wang, S., Zhang, H., **Gao, X.**, Zhang, X. (2022). Three Decades of Gross Primary Production (GPP) in China: Variations, Trends, Attributions, and Prediction Inferred from Multiple Datasets and Time Series Modeling. *Remote Sensing*, 14(11).
- Yang, Z., Dai, X., Wang, Z., **Gao, X.**, Qu, G., Li, W., Li, J., Lu, H. and Wang, Y. (2022). The dynamics of Paiku Co lake area in response to climate change. *Journal of Water and Climate Change*, 13(7), 2725-2746.
- Zhang, S., Dai, X., Li, J., **Gao, X.**, Zhang, F., Gong, F., Lu, H., Wang, M., Ji, F., Wang, Z. and Peng, P., (2022). Crop classification for UAV visible imagery using deep semantic segmentation methods. *Geocarto International*, 1-25.
- **Gao, X.**, Gray, J.M., Reich, B.J. (2021). Long-term, medium spatial resolution annual land surface phenology with a Bayesian hierarchical model. *Remote Sensing of Environment*, 261, 112484.
- **Gao, X.**, Gray, J., Cohrs, C.W., Cook, R., Albaugh, T.J. (2021). Longer greenup periods associated with greater wood volume growth in managed pine stands. *Agricultural and Forest Meteorology*, 297, 108237.
- Yoshizumi, A., Coffer, M. M., Collins, E. L., Gaines, M. D., **Gao, X.**, Jones, K., ... & Tateosian, L. (2020). A review of geospatial content in IEEE visualization publications. *2020 IEEE Visualization Conference (VIS), Salt Lake City, UT, USA,* pp. 51-55.
- **Gao, X.**, Jian, J., Dai, X., & Chen, W. (2016). Spectral curve matching application analysis based on Fréchet distance. *Geomatics and Information Science of Wuhan University*, 41(3), 408-414.

Presentations

- **Gao, X.**, Pasquarella, V., Thompson, J. R. (2024). Investigating four decades of species-specific land surface phenology derived from 30-m Landsat and Forest Inventory Analysis. *American Geophysical Union conference.* **Oral presentation**.
- **Gao, X.** (2024). Facilitate Nature-based Solutions by Improving Landscape Simulation and Remote Sensing. *Geo For Good 2024 Dublin Mini Summit, Google LLC*. **Invited Panel Speaker**.
- **Gao, X.** (2024). Observing and Understanding Plant Phenology and Climate Change through Satellite Remote Sensing. *Cary Institute of Ecosystem Studies*. **Invited talk**.
- **Gao, X.** (2024). Seeing Forest Seasonality from Space. *Harvard Forest Seminar, Harvard University*. **Invited talk**.
- **Gao, X.,** Pasquarella, V., Brown, C., Thompson, J. R. (2023). *G4E Science & Impact Talk, Google LLC*. **Invited talk**.
- **Gao, X.**, McGregor, I.R., Gray, J.M., Friedl, M.A., & Moon, M. (2023). Maximum leaf greenness is more associated with global vegetation productivity than growing season length. *Global Congress on Advanced Satellite Communications*. **Invited talk.**
- **Gao, X.**, Gray, J. (2022). Problems in the mechanistic spring phenology models. *American Geophysical Union conference*. **Poster presentation.**
- **Gao, X.**, Gray, J. (2022). Does chilling explain the divergent response of spring phenology to urban heat islands? *North Carolina State University Graduate Research Symposium*. **Poster presentation.**
- **Gao, X.** (2022). Observing Long-term annual land surface phenology at medium spatial resolution. *Indigo Ag, Inc. remote sensing group*. **Invited talk.**
- **Gao, X.**, McGregor, I., Gray, J. (2021). Satellite observations underestimate the effect of growing season length on global vegetation productivity. *American Geophysical Union conference*. **Oral presentation.**

- **Gao, X.**, Gray, J., Reich, B. (2020). Quantifying Long-term Land Surface Phenology with Uncertainty by 30 m Landsat Observations Using a Bayesian Hierarchical Model. *American Geophysical Union conference*. **Poster presentation.**
- **Gao, X.**, Gray, J., Cohrs, C., Cook, R. (2020). How does phenology control managed forest productivity? *CNR Graduate Research Symposium, North Carolina State University*. **Poster presentation.**

Media Exposures

- Graduating Student Spotlight: Xiaojie Gao. (2023). *Student Success*, *North Carolina State University*.
- Scientists Use Satellites to Track Earth 'Greening' Amid Climate Change. (2023). *News, North Carolina State University*.
- Observing Long-Term Annual Land Surface Phenology at Medium Spatial Resolution. (2021). *Center for Geospatial Analytics News, North Carolina State University*.

Honors and Awards

2024	● Open Science Grid (OSG) School 2024 Research Computing Travel Award. The OSG Consortium, University of Wisconsin-Madison.
2023	● Honorable Mention, 2023 Envisioning Research Contest (student/postdoc category). North Carolina State University.
2021	● Future Investigators in NASA Earth and Space Science Technology (FINESST) award, NASA ($135,000)
2017	● Surveying and Mapping Technology Improvement Award of Sichuan, China - Grade 1 ● Satellite Navigation and Position Technology and Science Award, China - Grade 1
2016	● Outstanding Graduate Award ● Excellent Graduation Thesis Award
2015	● First Prize for Comprehensive Performance of Hyperspectral Application Lab, Chinese Academy of Sciences ● Graduate Scholarship - Grade 2 ($1,500) ● Excellent Presentation of the 7th Master and Doctoral Forum of Sichuan, China
2014	● Special Contribution Award of Hyperspectral Application Lab, Chinese Academy of Sciences ● National Scholarship for Graduate Students ($7,000)
2013	● Excellent Article Award of the 3rd Graduate Forum of National Remote Sensing and Geo-Information Science - Grade 2

Research Projects

2023-present	**Co-produced modeling of socio-environmental dynamics of financialized forestlands and alternative future scenarios** (NSF-DISES, 22-05705) Postdoctoral Researcher: landscape simulation, nature-based climate solution.
2021-2023	**Does chilling explain the divergent response of spring phenology to urban heat islands? (**NASA FINESST awarded project, $135,000) Future Investigator: Ph.D. dissertation research

2019-2021 **An operational multisource land surface phenology product from Landsat and Sentinel 2** (NASA, NNH17ZDA001N-LCLUC)
Research Assistant: land surface phenology product quality assessment and validation

2014-2016 **Research on hyperspectral remote sensing intelligent observation mode for typical surface scene** (National Natural Science Foundation of China, No. 41371359)
Research Assistant: hyperspectral target detection algorithm design and implementation

Seminars & Workshops

- R programming in ecology studies. Workshop. (2024). *Research Experience for Undergraduate (REU) program. Harvard Forest, Harvard University*. **Lecturer**.
- GitHub and open science practice. Workshop. (2024). *Research Experience for Undergraduate (REU) program. Harvard Forest, Harvard University*. **Lecturer**.
- Show me the money: Be your own boss with grants and fellowships. (2022). Seminar. *Center for Geospatial Analytics, North Carolina State University*. **Invited guest speaker**.
- Open science best practices. (2022). Seminar. *Center for Geospatial Analytics, North Carolina State University*. **Lecturer**.
- High-performance computing in geospatial analytics. (2021). *Geospatial Data Mining class, North Carolina State University*. **Co-guest Lecturer**.
- Why do I program R in Visual Studio Code instead of RStudio? (2020). Workshop. *Center for Geospatial Analytics, North Carolina State University*. **Lecturer**.

Student Mentorships

- Casey Helton. University of North Georgia.
  05/2024-08/2024, Research Experience for Undergraduates (REU) program at Harvard Forest.
  Topic: Long-term phenological changes and carbon sequestration.

- Lu Hou. M.S. student. Guangzhou University, China.
  03/2023-present. Co-advisor with Dr. Jinnian Wang (Guangzhou University) and Dr. Yi Cen (Chinese Academy of Sciences).
  Publication: Hou, L., **Gao, X.***, Wang, J., Cen, Y.*. Extending Long-Term Vegetation Productivity Dynamics Using Remotely Sensed Phenology derived from Landsat Observations. *Draft available upon request*.

- Chongjing Zhu. M.S. student. Southwest University, China.
  09/2023-present. Co-advisor with Dr. Yao Li.
  Publication: Zhu, C., She, X., **Gao, X.***, Huang, Y., Zeng, Y., Ding, C., Fu, D., Shao, J., Li, Y*. (2024). Spatiotemporal variation of spring phenology and the corresponding scale effects and uncertainties: A case study in southwestern China. *International Journal of Applied Earth Observation and Geoinformation*, 135, 104294.

Journal Reviews

Nature Climate Change, Nature Communications, Remote Sensing of Environment, New Phytologist, Agricultural and Forest Meteorology, Science of the Total Environment, Ecological Indicators, Journal

of Geophysical Research: Biogeosciences, International Journal of Applied Earth Observation and Geoinformation, International Journal of Emerging Investigators (*a non-profit journal to prepare high-school students to be researchers*), Frontiers in Forests and Global Change (*Review Editor*).

Developed Tools

- "blsp" R package: A Bayesian hierarchical model that quantifies long-term annual land surface phenology from sparse time series of vegetation indices (model developed in Gao et al., 2021).
- "pnetr" R package: An easy-to-manage ecosystem modeling framework that includes a family of photosynthesis and evapotranspiration (PnET) models (documented in Gao et al 2024).
- "qgis_dev": A light-weight C++ GIS application based on QGIS.

Contacts of References

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Dr. Mark A. Friedl
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