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Fujiang Ji

Research Interests

Plant functional traits and functional diversity; Hyperspectral remote sensing; Data Fusion; Ecosystem process modeling; Radiative transfer modeling; Deep learning.

Educational Background

- **Ph.D.** degree in **Forestry**, Department of Forest and Wildlife Ecology, University of Wisconsin-Madison, WI, USA, September, 2021— December, 2025 (Expected).

  Research focuses *on plant functional traits and functional diversity estimation using hyperspectral imaging spectroscopy at both leaf and canopy scales over multiple ecological functional areas; multi-source remote sensing data fusion (spaceborne, airborne hyperspectral and multispectral data) using deep learning techniques.*

- **M.S.** degree in ***Cartography and Geographic Information System***, Aerospace Information Research Institute, Chinese Academy of Sciences, Beijing, China, September, 2018 – June, 2021.

  Research focuses *on integrating process-based modeling, remote sensing and data assimilation to estimate crop yield, soil available nutrients, etc.*

- **B.Eng.** degree in ***Remote sensing science and technology***, Chengdu University of Technology, Chengdu, China, September, 2014 – June, 2018.

Published Journal Articles

PEER-REVIEWED PAPERS

1. **Ji, F.;** Li, F.; Dashti, H.; Hao, D.; Townsend, P. A.; Zheng, T.; You, H.; Chen, M. Leveraging transfer learning and leaf spectroscopy for leaf trait prediction with broad spatial, species, and temporal applicability, *Remote sensing of Environment,* 2025, 326, 114818. https://doi.org/10.1016/j.rse.2025.114818
2. **Ji, F.;** Li, F.; Hao, D.; Shiklomanov, A. N.; Yang, X.; Townsend, P. A.; Dashti, H.; Nakaji, T., et al. Unveiling the transferability of PLSR models for leaf trait estimation: lessons from a comprehensive analysis with a novel global dataset. *New Phytologist*, 2024, 243: 111-131. https://doi.org/10.1111/NPH.19807
3. **Ji, F.;** Meng, J.; Cheng Z.; Fang H.; Wang Y. Crop Yield Estimation at field scales by Assimilating

Time Series of Sentinel-2 Data into a Modified CASA-WOFOST Coupled Model, *IEEE Trans. Geosci. Remote Sens*, 2021, PP (99): 1-14. https://doi.org/10.1109/TGRS.2020.3047102

4. **Ji, F.;** Meng, J.; Fang H. Study on Soybean Yield Estimation Using the Coupled CASA and WOFOST Model, *Remote Sensing Technology and Application*, 2020, 35(2): 406-415. (In Chinese with English Abstract). http://www.rsta.ac.cn/CN/Y2020/V35/I2/406
5. Liu, H.; Xiao, J.; Hao, D.; Li, F.; **Ji, F.;** Chen, M. Hotspot effect improves the ability of satellites to track terrestrial photosynthesis, *Remote sensing of Environment*, 2025, 317, 114492. https://doi.org/10.1016/j.rse.2024.114492
6. Li, F.; Zhu, Q.; Yuan, K.; **Ji, F.;** Paul, A.; Lee, P.; Radeloff, V. C.; Chen, M. Projecting Large Fires in the Western US With an Interpretable and Accurate Hybrid Machine Learning Method, *Earth's Future*, 2024. https://doi.org/10.1029/2024EF004588
7. Zeng, Y.; Hao, D.; Park, T.; Zhu, P.; Huete, A.; Myneni, R.; Knyazikhin, Y.; Qi, J.; Nemani, R. R.; Li, F.; Huang, J.; Gao, Y.; Li, B.; **Ji, F.;** Köhler, P.; Frankenberg, C.; Berry, J. A.; & Chen, M. Structural complexity biases vegetation greenness measures, *Nature Ecology & Evolution*, 2023. https://doi.org/10.1038/s41559-023-02187-6 [Link1, Link2, Link3, Link4, Link5, Free version]
8. Mao, H.; Meng, J.; **Ji, F.;** Zhang, Q.; Fang, H. Comparison of Machine Learning Regression Algorithms for Cotton Leaf Area Index Retrieval Using Sentinel-2 Spectral Bands, *Appl. Sci*. 2019, 9, 1459.2. https://doi.org/10.3390/app9071459
9. Cheng Z.; Meng, J.; **Ji, F.;** Wang Y.; Fang, H.; Yu L. Aboveground biomass estimation of late-stage maize based on the WOFOST model and UAV observations, *Journal of Remote Sensing*, 2020, 24(11): 1403-1418. (In Chinese with English Abstract). http://dx.doi.org/10.11834/jrs.20200069
10. Dai, X.; He, X.; Guo, S.; Liu, S.; **Ji, F.;** Ruan, H. Research on hyper-spectral remote sensing image classification by applying stacked denoising auto-encoders neural network, *Multimed Tools Appl*, 2021(5). https://doi.org/10.1007/s11042-021-10735-0
11. Zhang, S.; Dai, X.; Li, J.; Gao, X.; Zhang, F.; Gong, F.; Lu, H.; Wang, M.; **Ji. F.;** Wang, Z.; & Peng, P. Crop Classification for UAV Visible Imagery Using Deep Semantic Segmentation Methods, *Geocarto International*, 2022 1–23. https://doi.org/10.1080/10106049.2022.2032387

IN REVIEW/PREPARATION

1. **Ji, F.;** Yang, J.; Townsend, P. A.; Zheng, T.; Kovach, K. R.; Yu, T.; Yang, R.; Liu, M.; Chen, M. Robust hyperspectral reconstruction from satellite and airborne observations via a deep hierarchical fusion network across heterogeneous scenarios, 2025. (Under preparation).
2. **Ji, F.;** Zheng, T.; Shiklomanov, A. N.; Yang, R.; Townsend, P. A.; Li, F.; Hao, D.; Dashti, H.; Kovach, K. R.; You, H.; Zhou, J.; Chen, M. Tracking seasonal variability in plant traits from spaceborne PRISMA hyperspectral imagery across forest types and ecoregions, 2025. (Under review).
3. You, H.; **Ji, F.;** Park, T.; Radeloff, V. C.; Hurtt, G.; Jiang. M.; Chen, M. Global Forest Edge and its Dynamics in 21st Century, 2025. (Under review).

Conference presentations

1. **Ji, F.;** Li, F.; Hao, D.; Chen, M., et al. Estimating Leaf Functional Traits with Leaf Spectroscopy and Physics-guided Transfer Learning Based Physical Model Across Biomes, *AGU Fall Meeting 2022* (Chicago, U.S., Dec. 2022).
2. **Ji, F.;** Zheng, T.; Yang, R.; Kovach, K.R.; Townsend, P. A.; Dashti, H.; Chen, M.; Seasonal variations of plant traits from PRISMA hyperspectral imagery over multiple ecological functional areas, *AGU Annual Meeting 2024* (Washington, D. C., U.S., Dec. 2024).
3. **Ji, F.;** You, H.; Chen, M. Unveiling the transferability of PLSR models for leaf trait estimation: lessons from a comprehensive analysis with a novel global dataset, Bryson Scholarship Poster Session, University of Wisconsin-Madison (Madison, U.S., Feb. 2024).
4. **Ji, F.** Eyes in the sky: Decoding plant functional traits with imaging spectroscopy. Three Minute Thesis competition, University of Wisconsin-Madison (Madison, U.S., Sep. 2024).
5. **Ji, F.;** Zheng, T.; Yang, R.; Kovach, K.R.; Townsend, P. A.; Dashti, H.; Chen, M.; Seasonal variations of plant traits from PRISMA hyperspectral imagery over multiple ecological functional areas, *AmericaView Annual Meeting* (Madison, U.S., April., 2025).
6. Chen, M.; **Ji, F.;** Hao, D.; Zeng, Y.; et al. Fast estimation of leaf biochemical properties by inverting a simple leaf spectra model, *AGU Fall Meeting 2022* (Chicago, U.S., Dec. 2022).
7. You, H.; **Ji, F.;** Chen, M. Global Mappings of 21st-century Forest Edge Dynamic. Bryson Scholarship Poster Session, University of Wisconsin-Madison (Madison, U.S., Feb. 2024).
8. Dashti, H.; Chen, M. You, H.; **Ji, F.** Getting Started with Python for Analyzing Large Climate and Satellite Data, UW-Madison Research Bazaar, University of Wisconsin-Madison (Madison, U.S., Feb. 2024).

Projects and Research Experiences

- ***Graduate Research Assistant, University of Wisconsin-Madison, September, 2021 – December, 2025 (Expected).***
  1. **Advance spaceborne mapping of plant functional traits with high-resolution and hyperspectral data over sparse vegetation canopies (80NSSC24K0054),** *Mar. 2024 – Dec. 2025 (Expected).*

     Proposed a novel framework for data fusion and enable large-scale, repeatable plant functional trait mapping in sparsely vegetated areas through the unique combination of small commercial satellite sensors including 30/60 m spatial resolution hyperspectral DESIS or EMIT data (for trait mapping) with higher-resolution multispectral PlanetScope imagery (for characterizing sub-pixel variation).
  2. **Monitoring and understanding seasonal variations of forest functional traits and diversity by integrating observations from multi-source RS data,** *Sep. 2021– Dec. 2025.*

     Using satellite hyperspectral data (PRISMA, DESIS), NEON AOP data, in-situ leaf spectra and traits as well as different modeling methods (empirical, physical, hybrid) to investigate how does

functional traits and functional diversity vary over the growing season and across different forest ecosystems (different NEON sites).

- ***Graduate Research Assistant, Aerospace Information Research Institute, Chinese Academy of Sciences, September, 2018 – June, 2021.***
  1. **China High-resolution EO System – Quantitative Retrieval Technology of Vegetation Parameters from GF-6 WFV Satellite Image (30-Y20A03-9003-17/18-05)**, *2018-2019.*

     Using the WFV wide camera of the GF-6 satellite to estimate the yield of crops in the Xinjiang experimental area. I mainly completed the combination of the crop model and data assimilation algorithm based on the IDL language.
  2. **The STS (Science and Technology Service Network Initiative) Program of Chinese Academy of Sciences (KFJ-EW-STS-069)**, *2019-2020.*

     Conducted field campaigns and remote sensing monitoring at the field scale, including crop physiological/biochemical parameters retrieval, crop conditions, biomass, soil nutrient status, yield monitoring, etc. Also arranged monthly project meetings and draft monthly progress reports.
  3. **"Big Earth Data" Science Engineering Project of Chinese Academy of Sciences (CASEarth) – Big Earth Data Supports the U.N. Sustainable Development Goals (SDGs),** *2020.*

     Produced the 2000-2019 farmland productivity dataset in Northeast Eurasia by using the crop growth model through the JavaScript API interface of the Google Earth Engine platform; Wrote the SDGs 2.4 documents in both Chinese and English.
  4. **Precision Insurance of Wheat Based on Spatial Big Data**, *2018-2019.*

     Assimilating time-series remotely sensed data into crop growth to realize yield estimation, and crop disaster level assessment, and established a wheat insurance technical system.
- ***Undergrad Research Assistant, Chengdu University of Technology, September – December, 2016.***
  1. Research on technologies used to demarcate red-line areas of ecology in major districts and counties of Sichuan Province, China, initiated by a professor in the department, 2016.
- ***Project Leader, Chengdu University of Technology, 2017 – 2018.***
  1. **National College Students' innovation and entrepreneurship training program (Grant No. 201710616032),** *2017-2018.*

     Inversion and Detection of Parameter of the Growing Status of Rice based on Hyperspectral Data.

Honors and Awards

- National Encouragement Scholarship 2015
- Excellent Student of Chengdu University of Technology 2016&17
- Excellent Graduates of Sichuan Province, China [Link] 2017

- First prize of the 6th National College Student GIS Application Skills Competition [Link] 2017
- Excellent Student of Chengdu University of Technology 2017
- Postgraduate student Scholarship of University of Chinese Academy of Sciences 2020
- Excellent Student of University of Chinese Academy of Sciences [Link] 2020
- Annual Thomas O'Brien Award at Dept of Forest & Wildlife Ecology, UW-Madison 2024
- Annual Joon Lee Award at Dept of Forest & Wildlife Ecology, UW-Madison 2025

Technical Skills

- **Programming:** Python, R, ENVI/IDL, MATLAB, JavaScript, Linux shell, Git.
- **Models:** World Food Studies (WOFOST), AquaCrop, PROSPECT, PROSAIL, Leaf-SIP.
- **Computing:** High throughput computing (HTC), High Performance computing (HPC).
- **GIS and Remote sensing software:** GEE, ArcGIS, QGIS, ENVI, SNAP, ERDAS.
- **Statistical Analysis:** Regression, Machine learning, Deep learning, Network analysis.
- Skilled in remote sensing data processing, RS algorithm design and system development.
- Skilled in the instruments such as LAI 2200, SPAD 502, TDR 300, etc.

Service

- **Reviewer for scientific Journals:** *Agricultural and Forest Meteorology; Earth System Science Data*; *Remote Sensing*; *IEEE Transactions on Geoscience and Remote Sensing*; *Science of the Total Environment, Frontiers of Earth Science*.

Professional Affiliation

- Student Member of American Geophysical Union (AGU), 2022-2023. 2024-present.

References

Please find below the contact information for three referees who can provide recommendation letters:

1. **Min Chen (Advisor)**
   Title: Assistant Professor [Link]
   Institution: Department of Forest & Wildlife Ecology, University of Wisconsin-Madison.
   Email: mchen392@wisc.edu
2. **Philip A. Townsend**
   Title: Professor [Link]
   Institution: Department of Foret & Wildlife Ecology, University of Wisconsin-Madison.
   Email: ptownsend@wisc.edu
3. **Alexey N. Shiklomanov**
   Title: Research physical Scientist [Link]
   Institution: NASA Goddard Space Flight Center.
   Email: alexey.shiklomanov@nasa.gov