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Fei Yao

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Summary

Dr. Fei Yao is currently a Research Scientist at the National Centre for Earth Observation and the School of GeoSciences, University of Edinburgh. He has long been dedicated to interdisciplinary research in environmental and Earth sciences, with a primary focus on the socioeconomic drivers of the atmospheric composition variations and their impacts on energy, the environment, and public health. As of March 2025, he has published 17 peer-reviewed articles in top-tier journals, including 8 as first/corresponding authors. His research provides critical scientific foundations for understanding and addressing global climate change, improving air quality, advancing public health, and promoting renewable energy development.

Employment

- **Apr 2023 – Present (Open–ended)** Research Scientist, National Centre for Earth Observation, University of Edinburgh
- **Mar 2022 – Mar 2023** Postdoctoral Research Associate, School of GeoSciences, University of Edinburgh
- **Oct 2021 – Feb 2022 (Part–time)** Research Consultant, Edinburgh Innovations Limited, University of Edinburgh

Education

- **Sep 2018 – Mar 2022** PhD in Atmospheric and Environmental Sciences, School of GeoSciences, University of Edinburgh (Supervisor: Prof. Paul I. Palmer). The key research chapters of my thesis, *Understanding particulate matter pollution and photovoltaic power output using data and models*, have been peer-reviewed and published[14,10].
- **Aug 2015 – Jul 2018** MSc in Geography: Urban and Regional Planning, School of Urban Planning and Design, Peking University (Supervisor: Prof. Jiansheng Wu). The key research chapters of my thesis, *VIIRS–based remote sensing estimation of ground–level $PM_{2.5}$ concentrations in China*, have been peer-reviewed and published[6,5].
- **Sep 2011 – Jul 2015** BSc in Geographic Information System, School of Geography, East China Normal University (Advisor: Prof. Xuepei Han). The key research chapters of my thesis, *VIIRS–based remote sensing estimation of ground–level $PM_{2.5}$ concentrations in Beijing–Tianjin–Hebei*, have been peer-reviewed and published[2].

Publications (*: Corresponding authors; #: Co-first authors)

In revision, in review, submitted, in preparation (4)

21. Zheng, Z., Liu, J.* and **Yao, F.***, 2025. Estimating $PM_{2.5}$ concentrations from multi-view smartphone photographs: A large-scale spatiotemporally registered image–$PM_{2.5}$ corpus and a local feature fusion approach. In preparation.
20. Yin, K.#, **Yao, F.#**, Luo, N., Yi, B.* and Lu, X.*, 2025. Substantial reduction of solar photovoltaic potential in China by an extreme dust event. Submitted.
19. Wang, H., Maslanka, W., Palmer, P.I.*, Wooster, M.J., Wang, H., Yao, F., Feng, L., Wu, K., Lu, X.* and Fan, S.*, 2025. The role of diurnally varying African biomass burning emissions on tropospheric ozone. Submitted.
18. **Yao, F.***, Palmer, P.I., Liu, J., Chen, H. and Wang, Y., 2025. Attribution of Solar Energy Yield Gaps due to Transboundary Particulate Matter Pollution Associated with Trade Across Northeast Asia. In review.

Peer-reviewed (17)

17. Liu, J.#, **Yao, F.#**, Chen, H.* and Zhao, H.*, 2025. Quantifying the source—receptor relationships of $PM_{2.5}$ pollution and associated health impacts among China, South Korea, and Japan: A dual perspective and an interdisciplinary approach. *Environmental Health Perspectives*, 133(3-4), p.047011. doi: 10.1289/EHP14550.
16. Wang, Y., Wang, H., **Yao, F.***, Stouffs, R. and Wu, J.*, 2024. An integrated framework for jointly assessing spatiotemporal dynamics of surface urban heat island intensity and footprint: China, 2003–2020. *Sustainable Cities and Society*, 112, p.105601. doi: 10.1016/j.scs.2024.105601.
15. Marvin, M.R.*, Palmer, P.I., Yao, F., Latif, M.T. and Kahn, M.F., 2024. Uncertainties from biomass burning aerosols in air quality models obscure public health impacts in Southeast Asia. *Atmospheric Chemistry and Physics*, 24(6), pp.3699–3715. doi: 10.5194/acp-24-3699-2024.
14. **Yao, F.*** and Palmer, P.I., 2022. Source Sector Mitigation of Solar Energy Generation Losses Attributable to Particulate Matter Pollution. *Environmental Science & Technology*, 56(12), pp.8619–8628. doi: 10.1021/acs.est.2c01175.
13. Wu, J.*, Wang, Y., Liang, J. and Yao, F., 2021. Exploring common factors influencing $PM_{2.5}$ and O_3 concentrations in the Pearl River Delta: Tradeoffs and synergies. *Environmental Pollution*, 285, p.117138. doi: 10.1016/j.envpol.2021.117138.
12. Liu, J.*, Li, J. and Yao, F., 2022. Source-receptor relationship of transboundary particulate matter pollution between China, South Korea and Japan: Approaches, current understanding and limitations. *Critical Reviews in Environmental Science and Technology*, 52(21), pp.3896-3920. doi: 10.1080/10643389.2021.1964308.

11. Mogno, C.*, Palmer, P.I., Knote, C., Yao, F. and Wallington, T.J., 2021. Seasonal distribution and drivers of surface fine particulate matter and organic aerosol over the Indo-Gangetic Plain. *Atmospheric Chemistry and Physics*, 21(14), pp.10881-10909. doi: 10.5194/acp-21-10881-2021.
10. **Yao, F.*** and Palmer, P.I., 2021. A model framework to reduce bias in ground-level $PM_{2.5}$ concentrations inferred from satellite-retrieved AOD. *Atmospheric Environment*, 248, p.118217. doi: 10.1016/j.atmosenv.2021.118217.
9. Guo, H., Zhan, Q., Ho, H.C., Yao, F., Zhou, X., Wu, J. and Li, W.*, 2020. Coupling mobile phone data with machine learning: How misclassification errors in ambient $PM_{2.5}$ exposure estimates are produced? *Science of The Total Environment*, 745, p.141034. doi: 10.1016/j.scitotenv.2020.141034.
8. Guo, H., Li, W.*, Yao, F., Wu, J., Zhou, X., Yue, Y. and Yeh, A.G., 2020. Who are more exposed to $PM_{2.5}$ pollution: A mobile phone data approach. *Environment international*, 143, p.105821. doi: 10.1016/j.envint.2020.105821.
7. Wu, J., Liang, J., Zhou, L., Yao, F. and Peng, J.*, 2019. Impacts of AOD Correction and Spatial Scale on the Correlation between High-Resolution AOD from Gaofen-1 Satellite and In Situ $PM_{2.5}$ Measurements in Shenzhen City, China. *Remote Sensing*, 11(19), p.2223. doi: 10.3390/rs11192223.
6. **Yao, F.**, Wu, J.*, Li, W.* and Peng, J., 2019. A spatially structured adaptive two-stage model for retrieving ground-level $PM_{2.5}$ concentrations from VIIRS AOD in China. *ISPRS Journal of Photogrammetry and Remote Sensing*, 151, pp.263-276. doi: 10.1016/j.isprsjprs.2019.03.011.
5. **Yao, F.**, Wu, J.*, Li, W. and Peng, J., 2019. Estimating Daily $PM_{2.5}$ Concentrations in Beijing using 750-M VIIRS IP AOD Retrievals and a Nested Spatiotemporal Statistical Model. *Remote Sensing*, 11(7), p.841. doi: 10.3390/rs11070841.
4. **Yao, F.**, Si, M., Li, W.* and Wu, J.*, 2018. A multidimensional comparison between MODIS and VIIRS AOD in estimating ground-level $PM_{2.5}$ concentrations over a heavily polluted region in China. *Science of the Total Environment*, 618, pp.819-828. doi: 10.1016/j.scitotenv.2017.08.209.
3. Wang, Z., Yao, F., Li, W. and Wu, J.*, 2017. Saturation Correction for Nighttime Lights Data Based on the Relative NDVI. *Remote Sensing*, 9(7), p.759. doi: 10.3390/rs9070759.
2. Wu, J., Yao, F., Li, W.* and Si, M., 2016. VIIRS-based remote sensing estimation of ground-level $PM_{2.5}$ concentrations in Beijing–Tianjin–Hebei: A spatiotemporal statistical model. *Remote Sensing of Environment*, 184, pp.316-328. doi: 10.1016/j.rse.2016.07.015.
1. **Yao, F.**, Ye, K. and Zhou, J.*, 2015. Automatic image classification and retrieval by analyzing plant leaf features. *Journal of Zhejiang A&F University*, 32(3), pp.426-433. doi: 10.11833/j.issn.2095-0756.2015.03.015.

Non-peer-reviewed grey literature (1)

1. **Yao, F.**, 2017. Impacts of "source" and "sink" landscape patterns on ground–level $PM_{2.5}$ concentrations in Beijing–Tianjin–Hebei, China. *Won the First Prize in the 25th Challenge Cup at Peking University.*

Presentations (Selected)

9. AGU24, Washington, D.C., US, 9-13 December 2024.
   Oral: Impacts of Air Pollutant Emissions on Solar Energy Generation.
   Poster: Mapping Asian anthropogenic NO_x emissions using GEMS NO_2 and the Adjoint of GEOS-Chem.
8. National Earth Observation Conference 2024, York, UK, 10-12 September 2024.
   Oral: Inverse modelling of SO_2 and NO_x emissions over Asia using GEMS geostationary satellite observations.
   Keynote: Commerce, pollution, and solar energy yield gaps.
7. ESA ATMOS 2024, Bologna, Italy, 1-5 July 2024.
   Oral: Estimating hourly nitrogen oxide emissions across Asia using GEMS geostationary satellite data. link.
   Poster: Automated Detection and Attribution of Methane Super-Emitters Using Sentinel-2 Satellite Data and Deep Learning.
6. The EGU General Assembly 2024, Vienna, Austria, 14-19 April 2024.
   Highlight Oral: Impacts of Air Pollutant Emissions on Solar Energy Generation. doi: 10.5194/egusphere-egu24-4715.
   Highlight Poster: Estimating Hourly Nitrogen Oxide Emissions Across Asia Using Data from the GEMS Geostationary Satellite. doi: 10.5194/egusphere-egu24-3198.
5. SAGES 2023 Annual Science meeting, Aberdeen, UK, 16-17 May 2023.
   Oral: How do air pollutant emissions influence solar energy generation?
4. The 1st GEOS-Chem Europe Meeting, Virtual, 1-2 September 2020.
   Poster: A model framework to reduce bias in ground-level $PM_{2.5}$ concentrations from satellite-retrieved AOD.
3. The 9th International GEOS-Chem Meeting, Cambridge, MA, US, 6-9 May 2019.
   Poster: $PM_{2.5}$ over China inferred from MAIAC AOD and GEOS-Chem: preliminary results.
2. Palmer Group Meeting, Edinburgh, UK, 15 February 2019.
   Oral: AWS Cloud for Atmospheric Scientists.
1. The 10th International Association for China Planning Conference, Beijing, China, 30 June - 3 July 2016.
   Oral: Remote sensing estimation of ground-level $PM_{2.5}$ concentrations in Beijing-Tianjin-Hebei: A spatiotemporal statistical model.

Research Grants

Ongoing (1)

1. Natural Environment Research Council. National Centre for Earth Observation (NCEO) – Long-term single science (LTS-S). Apr 2018 – present. Participating as a key team member.

Completed (10)

10. CEOI 16th Call Flagship Proposal 2023. The Near Infrared Multispectral Camera for Atmospheric Methane (NIMCAM): Instrument demonstration and space mission development. Jan 2024 – Feb 2025. Participating.
9. IT Small Grants and Global Change Small Grants of School of GeoSciences at the University of Edinburgh. Establishing a satellite-based detecting and early-warning system for worldwide methane leaks. Jan 2023 – Jul 2024. **PI**.
8. Google Cloud Research Credits Program and Earth Engine Uplift Program. Harnessing satellite observations of methane to inform climate change mitigation strategies. Oct 2022 – Jan 2024. **PI**.
7. IT Small Grants of School of GeoSciences at the University of Edinburgh. Improving solar energy generation by reducing anthropogenic source sector emissions. Jan 2021 – Jul 2021. **PI**.
6. Shenzhen Knowledge Innovation Program (No. JCYJ20170412150910443). Study on the regulatory function and mechanism of urban green spaces on atmospheric particulate matter. July 2017 – July 2020. Participating.
5. Presidential Research Fund of Peking University Shenzhen Graduate School (No. 201607). Estimating ground-level $PM_{2.5}$ concentrations in Beijing-Tianjin-Hebei based on multi-source remote sensing data. Jan 2017 – Jun 2017. **PI**.
4. Presidential Research Fund of Peking University Shenzhen Graduate School (No. 2015017). Estimating ground-level $PM_{2.5}$ concentrations and associated health effects in Beijing-Tianjin-Hebei based on a spatiotemporal statistical model. Jan 2016 – Jun 2016. **PI**.
3. Presidential Research Fund of Peking University Shenzhen Graduate School (No. 2015022). Spatial equity analysis of urban green space from the perspective of balance between supply and demand: A case study of Futian District, Shenzhen, China. Jan 2016 – Jun 2016. Participating.
2. National Training Program of Innovation and Entrepreneurship for Undergraduates (No. 201410269099). Automatic image classification and retrieval by analyzing plant leaf features. Oct 2014 – Jun 2015. **PI**.
1. National Training Program of Innovation and Entrepreneurship for Undergraduates (No. 201410269093). Spatiotemporal distribution characteristics of $PM_{2.5}$ concentrations and their correlation with meteorological factors: A case study of Shanghai in 2013. Oct 2014 – Jun 2015. Participating.

Teaching and Services

- Tutor & Demonstrator at the University of Edinburgh: *Earth's Atmospheric Composition* (Spring 2020, 2021), *Visual Analytics* (Spring 2019), *Welcome Week Computing Induction* (Autumn 2019).
- Referee for Academic Journals: *Environmental Science & Technology*, *Remote Sensing of Environment*, *ISPRS Journal of Photogrammetry and Remote Sensing*, *Atmospheric Environment*, *Journal of the Royal Statistical Society: Series C*, *Journal of Cleaner Production*, *IEEE Transactions on Knowledge and Data Engineering*, *International Journal of Digital Earth*, *Geocarto International*, *Remote Sensing Applications: Society and Environment*, *Remote Sensing*, among others.

Honors and Awards (Selected)

5. National Scholarship, awarded by Ministry of Education of the People's Republic of China, 2013, 2016, 2017.
4. Excellent Graduate, awarded by Peking University, Jun 2018.
3. Exceptional Award for Academic Innovation, awarded by Peking University, Dec 2016 and 2017.
2. 2016 IACP Best Student Paper Award, awarded by International Association for China Planning, July 2016.
1. Excellent Graduate, awarded by Shanghai Municipal Education Commission, May 2015.

Technical Expertise

- Programming: Python, FORTRAN, etc.
- Model: GEOS-Chem model of atmospheric chemistry and transport and its adjoint, statistical, machine and deep learning, solar photovoltaic performance modelling, etc.
- Software: ArcGIS Desktop suite, Microsoft Office suite, etc.
- Language: Mother Tongue of Chinese, and Proficient in English.