Curriculum Vitae

Sihong WU (swu36@central.uh.edu)

Department of Earth and Atmospheric Sciences,
University of Houston, Houston, TX, 77204

Education

2016-2021 **Ph.D.** in Geophysics, Peking University, Beijing, China
- Thesis: *De-noising and inversion of transient electromagnetic data based on the deep learning methods*
- Advisor: Prof. Qinghua HUANG

2012-2016 **B.S.** in Geophysics, University of Science and Technology of China, Anhui, China
- Enrolled in Special Class for the Gifted Young (for age 16 and under)

Appointment

2023-present **Postdoctoral Researcher**
- Department of Earth & Atmospheric Sciences, University of Houston, TX, USA
- Department of Department of Electrical and Computer Engineering, University of Houston, TX, USA
- Supervisor: Prof. Jiajia SUN, Prof. Jiefu CHEN

2021-2023 **Postdoctoral Researcher**
- Department of Geophysics, Peking University, Beijing, China
- Supervisor: Prof. Qinghua HUANG

Research Interests

Signal processing, imaging, inversion and uncertainty quantification of electromagnetic data
- Researching deep learning-based signal processing, imaging, modeling, inversion and uncertainty quantification techniques to efficiently reconstruct accurate subsurface resistivity models with improved investigation depth from airborne, controlled-source, borehole and marine electromagnetic data.

Uncertainty quantification of geophysical inverse problems
- Researching advanced unsupervised machine learning techniques to reconstruct posterior model distributions in an efficient manner.

Joint inversion and interpretation
- Developing advanced algorithms for joint inversion and interpretation of electromagnetic data with other geophysical data, including seismic, magnetic and gravity data, for comprehensive subsurface characterization.

Near-surface investigation and exploration
- Applying electromagnetic methods to characterize subsurface properties, aiding in mineral exploration, new energy resource detection, hydrologic process monitoring, and environmental assessments.

Peer-reviewed Publications

12. **Wu, S.**, Thoram, S., Sun, J., Sager, W. W. & Chen, J., 2025. Understanding oceanic crust formation through marine magnetic anomaly characterization based on machine learning. Journal of Geophysical Research: solid earth, 130(2), e2024JB030682. https://doi.org/10.1029/2024JB030682.

11. **Wu, S.**, Huang, Q. & Zhao, L., 2024. Physics-informed deep learning-based inversion for airborne electromagnetic data. *Geophysical Journal International*, 238, 1774-1789. https://doi.org/10.1093/gji/ggae244.

10. **Wu, S.**, Huang, Q. & Zhao, L., 2023. Fast Bayesian inversion of airborne electromagnetic data based on the invertible neural network. *IEEE Transactions on Geoscience and Remote Sensing*, 61, 5907211. https://doi.org/10.1109/TGRS.2023.3264777.

9. **Wu, S.**, Huang, Q. & Zhao, L., 2023. A deep learning-based network for the simulation of airborne electromagnetic responses. *Geophysical Journal International*, 233, 253-263. https://doi.org/10.1093/gji/ggac463.

8. **Wu, S.**, Huang, Q. & Zhao, L., 2022. Instantaneous inversion of airborne electromagnetic data based on deep learning. *Geophysical Research Letters*, 49(10), e2021GL097165. https://doi.org/10.1029/2021GL097165.

7. **Wu, S.**, Huang, Q. & Zhao, L., 2021. Convolutional neural network inversion of airborne electromagnetic data. *Geophysical Prospecting*, 69(8-9), 1761-1772. https://doi.org/10.1111/1365-2478.13136.

6. **Wu, S.**, Huang, Q. & Zhao, L., 2021. De-noising of transient electromagnetic data based on the long short-term memory-autoencoder. *Geophysical Journal International*, 224(1), 669-681. https://doi.org/10.1093/gji/ggaa424.

5. Xue, J., Huang, Q., **Wu, S.**, Zhao, L. & Ma, B., 2024. Real-time dual-parameter full-waveform inversion of GPR data based on robust deep learning. *Geophysical Journal International*, 238, 1755-1771. https://doi.org/10.1093/gji/ggae243.

4. Xue, J., Huang, Q., **Wu, S.** & Zhao, L., 2024. Detection of ULF geomagnetic anomalies prior to the Tohoku-Oki Earthquake by the multi-reference station method. *IEEE Transactions on Geoscience and Remote Sensing*, 62, 5910009. https://doi.org/10.1109/TGRS.2024.3382472.

3. Xue, J., **Wu, S.**, Huang, Q., Zhao, L., Sarlis, N. V. & Varotsos, P. A., 2023. RASE: A real-time automatic search engine for anomalous seismic electric signals in geoelectric data. *IEEE Transactions on Geoscience and Remote Sensing*, 61, 5905911. https://doi.org/10.1109/TGRS.2023.3260202.

2. Xue, J., Huang, Q., **Wu, S.** & Nagao, T., 2022. LSTM-autoencoder network for the detection of seismic electric signals. *IEEE Transactions on Geoscience and Remote Sensing*, 60, 5917012. https://doi.org/10.1109/TGRS.2022.3183389.

1. Wang, K., Huang, Q. & **Wu, S.**, 2020. Application of long short-term memory neural network in geoelectric field data processing. *Chinese Journal of Geophysics* (in Chinese), 63(8), 3015-3024. https://doi.org/10.6038/cjg2020O0119.

Papers under Review or in Preparation

4. **Wu, S.,** Sun, J., & Chen, J. Variational inference for geophysical inverse problems using normalization flows: an unsupervised approach to electromagnetic data inversion. Geophysical Journal International, under review.
3. Huang, Q., **Wu, S.** & Xue, J. Data science and machine learning in geo-electromagnetics: a review. Surveys in Geophysics, under review.
2. Bittar, G., **Wu, S.**, Su, Y., Sun, J., Wu, X., Huang, Y., Zeng, S. & Chen, J. Real-time Bayesian inversion and uncertainty quantification of ultra-Deep resistivity measurements using invertible neural network. Computers and Geosciences, under review.
1. Su, Y., **Wu, S.**, Sun, J., Wu, X., Huang, Y., Chen, J., Lu, L., Wei, X. & Christiansen, R. Targeting the serpentinite for geologic hydrogen exploration by joint analysis of gravity and aeromagnetic data. International Journal of Hydrogen Energy, under review.

Conference Papers

16. **Wu, S.**, Thoram, S., Sun, J., Sager, W. W. & Chen, J., 2024. Transforming the interpretation of marine magnetic anomalies through a machine learning-based framework. In AGU (American Geophysical Union) Annual Meeting Abstracts.

15. **Wu, S.**, Sun, J. & Chen, J., 2024. Fast model uncertainty evaluation of airborne frequency-domain electromagnetic data inversion based on deep learning. In AGU Annual Meeting Abstracts.

14. Su, Y., **Wu, S.**, Chen, J., Sun, J. & Lu, L., 2024. Identifying natural hydrogen reservoirs through integrated 3D aeromagnetic and gravity data inversion in Bartlett Springs fault zone in north California. In AGU Annual Meeting Abstracts.

13. Sun, J., **Wu, S.**, Chen, J. & Yin, Z., 2024. Bayesian inference of airborne electromagnetic data based on normalizing flows. In AGU Annual Meeting Abstracts.

12. Huang, Q., Xue, J. & **Wu, S.**, 2024. Data science and machine learning in geo-electromagnetics. In EM Induction Workshop Abstracts.

11. **Wu, S.,** Sun, J. & Chen, J., 2024. Stochastic inversion of frequency-domain airborne electromagnetic data based on deep learning. In the International Meeting for Applied Geoscience & Energy (IMAGE) Abstracts.

10. Kalu, D. V., **Wu, S.** & Sun, J., 2024. Empowering mineral exploration: Leveraging invertible neural networks for magnetotelluric data inversion and uncertainty quantification. In IMAGE Abstracts.

9. Bittar, G., Su, Y., **Wu, S.**, Sun, J., Wu, X., Huang, Y. & Chen, J., 2024. Fast inversion and uncertainty quantification of electromagnetic well logging data using invertible neural network. In IMAGE Abstracts.

8. **Wu, S.**, Sun, J. & Chen, J., 2024. Airborne electromagnetic data interpretation with deep learning-based stochastic inversion and posterior distribution clustering with application to salinization detection. In International Workshop on Gravity, Electrical & Magnetic Methods and Their Applications (GEM) Abstracts.

7. **Wu, S.**, Huang, Q. & Zhao, L., 2023. Simultaneous resistivity imaging of airborne electromagnetic data based on deep learning. In JpGU (Japan Geoscience Union) Geoscience Union Meeting

Abstracts.

6. **Wu, S.**, Huang, Q. & Zhao, L., 2023. Near real-time subsurface structure imaging using airborne electromagnetic data based on deep learning. In EGU (European Geosciences Union) General Assembly Abstracts.

5. **Wu, S.**, Huang, Q. & Zhao, L., 2022. Near real-time resistivity imaging from airborne electromagnetic data based on deep learning. In CGU (Chinese Geosciences Union) Annual Meeting Abstracts.

4. **Wu, S.**, Huang, Q. & Zhao, L., 2021. 1-D inversion of airborne transient electromagnetic data based on convolutional neural network. In CGU Annual Meeting Abstracts.

3. **Wu, S.**, Huang, Q. & Zhao, L., 2021. Convolutional neural network inversion of airborne transient electromagnetic data. In CIGEW (China International Geo-Electromagnetic Workshop) Abstracts.

2. **Wu, S.**, Huang, Q. & Zhao, L., 2020. De-noising of transient electromagnetic data based on the LSTM-autoencoder. In CGU Annual Meeting Abstracts.

1. **Wu, S.** & Huang, Q., 2019. De-noising of transient electromagnetic data based on the LSTM-autoencoder. In CIGEW Abstracts.

Research Grants

7. Grants to Enhance and Advance Research at the University of Houston. **Co-Principal Investigator**. *An integrated framework for natural hydrogen reservoir identification through geophysical, geological, and machine learning approaches*. Project period: 04/2025-10-2026. Funding: 40,000 USD.

6. National Natural Science Foundation of China. No. 42204074. **Principal Investigator**. *De-noising of airborne transient electromagnetic data based on deep learning*. Project period: 01/2023-12/2024. Funding: 200,000 RMB.

5. China Postdoctoral Science Foundation. No. 2022M720214. **Principal Investigator**. *Bayesian inversion of airborne electromagnetic data based on deep learning*. Project period: 01/2023-12/2024. Funding: 80,000 RMB.

4. National Natural Science Foundation of China. No. U2239201. **Collaborator**. *Study on the spatiotemporal characteristics of seismic electromagnetic anomalies in the Sichuan-Yunnan region and their relationship with seismic activity*. Project period: 01/2023-12/2026. Funding: 2,870,000 RMB.

3. National Natural Science Foundation of China. No. 42274088. **Collaborator**. *Study on the electrical structure of the middle to upper mantle in the Chinese Mainland based on geomagnetic diurnal variations*. Project period: 01/2023-12/2026. Funding: 560,000 RMB.

2. National Natural Science Foundation of China. No. 41874082. **Collaborator**. *Study of joint methodology integrating wavelet analysis and probability tomography of self-potential data and the application in landslide monitoring*. Project period: 01/2019-12/2022. Funding: 650,000 RMB.

1. National Natural Science Foundation of China. No. 41804072. **Collaborator**. *Three-dimensional*

forward modeling of global and regional-scale ocean tidal electromagnetic signals. Project period: 10/2019-12/2020. Funding: 250,000 RMB.

Invited Talks

2025 *Data science for energy transition.* Guest instructor in NSF Data Science Corps Summer Camp, online

2025 *Advancing subsurface characterization with deep generative models.* Department of Petroleum Engineering Weekly Seminar, Houston, TX.

2024 *Advancing the interpretation of potential field geophysical data with deep generative models.* Geophysical Society of Houston Potential Fields Special Interest Group, Houston, TX.

2024 *Data science for energy transition.* Guest instructor in NSF Data Science Corps Summer Camp, online

2024 *Airborne electromagnetic data inversion and uncertainty quantification using deep learning.* The United States Geological Survey, online

2023 *Generative AI for Geoscience Applications.* Amazon Web Services, Houston, TX

2023 *Deep learning-based inversion and uncertainty quantification of airborne electromagnetic data*. China Aero Geophysical Survey & Remote Sensing Center for Natural Resources, Beijing, China

2023 *Deep learning-based inversion and uncertainty quantification of airborne electromagnetic data*. National Institute of Natural Hazard, Ministry of Emergency Management of the People's Republic of China, Beijing, China

Teaching Experiences

Peking University

2020 Graduate, Electromagnetic Field Experiment (2 students)

2019 Undergraduate, Earthquake Country (320 students)

Field Experiences

2020 Tangshan, China, magnetic and frequency-domain electromagnetic (FEM) measurements, to investigate the underground structure beneath a large-scale surface collapse.
Magnetic survey: GEM GSM-19T system, 913 soundings, 10 lines, 62,500 m^2
FEM survey: GEM-2 system, 5 frequencies, 878 measurement locations, 10 lines, 62500 m^2

2018 Jingdezhen, China, magnetotellurics (MT) and controlled-source electromagnetic (CSEM) measurements, to investigate the world's largest known tungsten deposit.
MT survey: V5-2000 system, 12 frequencies, 30 measurement locations, 5 km^2
CSEM survey: Bureau of Geophysical Prospecting, TFEM-1, 10 frequencies, 90 measurement locations, 3 lines, 5 km^2

Honors and awards

2022 Outstanding Doctoral Dissertation Award, Chinese Geophysical Society

2021 Excellent Graduate Award, Peking University

2020 Outstanding Student Presentation Award, Chinese Geosciences Union Annual Meeting
Hai Liang Scholarship, Peking University
Merit Student Award, Peking University

2019 Outstanding Student Presentation Award, Chinese Geophysical Society
Award for Scientific Research, Peking University

2018 Award for Scientific Research, Peking University

Services

Professional organizations and meetings

2025 Session co-chair for GM 2 Interpretation and Case Studies
IMAGE, Houston, TX, USA

2025 Session co-chair for NEF 2 Geothermal and Critical Minerals
IMAGE, Houston, TX, USA

2025 Session co-chair for NEF P4 Geologic Hydrogen 2
IMAGE, Houston, TX, USA

2024 Session convener for T001-I. Advances in machine learning applications in marine geosciences: from data acquisition and analysis to interpretation across varied marine environments and scales
AGU, Washington, D.C., USA

2024 Session co-convener for NS008. Advances in Multimethod Geophysical Data Interpretation and Other Applications of Machine Learning
AGU, Washington, D.C., USA

2024 Guest Editor for special issue on Frontiers in Electromagnetic Geophysics, **Geophysics**

2024 Session co-chair for NEF P1 Emerging Energy: Building the Future on the Past 2
IMAGE, Houston, TX, USA

2024 Session co-chair for EM 1 Modeling and Inversion
IMAGE, Houston, TX, USA

2023 Session co-chair for S-EM14 Electric, magnetic and electromagnetic survey technologies and scientific achievements
JpGU Geoscience Union Meeting, Chiba, Japan

Reviewers

- *Science Advances*
- *Geophysical Journal International,*
- *IEEE Transactions on Geoscience and Remote Sensing,*
- *IEEE Geoscience and Remote Sensing Letters,*
- *IEEE Journal of Selected Topics in Signal Processing,*
- *Geophysics,*
- *Geophysical Prospecting,*
- *Chinese Journal of Geophysics*