

# 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 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**

11. **Wu, S.**, Huang, Q. & Zhao, L. 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**

2. **Wu, S.**, Thoram, S., Sun, J., Sager, W. W. & Chen, J. Understanding oceanic crust formation through marine magnetic anomaly characterization based on machine learning. In preparation.
1. Huang, Q., Xue, J. & **Wu, S.** Data science and machine learning in geo-electromagnetics: a review. In preparation.

## **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**

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**

- 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<sup>2</sup>  
 FEM survey: GEM-2 system, 5 frequencies, 878 measurement locations, 10 lines, 62500 m<sup>2</sup>  
 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<sup>2</sup>  
 CSEM survey: Bureau of Geophysical Prospecting, TFEM-1, 10 frequencies, 90 measurement locations, 3 lines, 5 km<sup>2</sup>

## **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**

- 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**

- *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*