

Xiaolong Wei

Department of Earth & Planetary Sciences, Stanford University
Room 315, Green Building, 367 Panama St, Stanford, California, 94305

Email: xwei2@stanford.edu

[Website](#) | [Google Scholar](#) | [Github](#) | [ORCID](#)

Education

2018–2022 **Ph.D. in Geophysics**, University of Houston, Houston, USA
2015–2018 **M.S. in Geology**, Northwest University, Xi'an, China
2011–2015 **B.S. in Geophysics**, China University of Geosciences, Beijing, China

Professional Appointment

01/2023–
present **Postdoctoral Research Fellow**, Stanford University, Stanford, USA

Research Interests

- **Detect, characterize, and monitor subsurface natural resources**
 - Critical minerals, freshwater, hydrocarbon, and geothermal energy
 - Subsurface model construction using multiple geoscientific observations (e.g., geophysics, geochemistry, geology, rock physics, etc)
- **Decision-driven environmental geoscience**
 - Bayes' theorem and uncertainty quantification
 - Data assimilation and data fusion
 - Decision theory, reinforcement learning, and AI

Publications

Peer-reviewed

15. **Wei, X.**, Yin, Z. and Caers, J., 2024. Falsification of geological hypotheses using drillholes and geophysics. *Surveys in Geophysics* (submitted)
14. **Wei, X.**, Yin, Z., Bonner, W. and Caers, J., 2024. Knowledge-driven stochastic modeling of geological geometry features conditioned on drillholes and outcrop contacts. *Computers and Geosciences* (under review)
13. **Wei, X.**, Yin, Z., Schedit, C., Darnell, K., Wang, L. and Caers, J., 2024. Constructing priors for geophysical inversions constrained by surface and borehole geochemistry *Surveys in Geophysics*. doi:[10.1007/s10712-024-09843-x](https://doi.org/10.1007/s10712-024-09843-x).

12. Guo, R., Zhou, H., **Wei, X.**, Lin, Z., Li, M., Eldar, Y.C., Yang, F., Xu, S. and Abubakar, A., 2024. Deep joint inversion of multiple geophysical data with U-net reparameterization. *Geophysics*, 90(3), pp.1-68. doi:[10.1190/geo2024-0210.1](https://doi.org/10.1190/geo2024-0210.1).
11. **Wei, X.**, Sun, J. and Sen, M., 2024. 3D Monte Carlo geometry inversion using gravity data. *Geophysics*, 89(3), pp.1-62. doi:[10.1190/geo2023-0498.1](https://doi.org/10.1190/geo2023-0498.1).
10. **Wei, X.**, Sun, J. and Sen, M., 2024. Reconstruction of multiple target bodies using trans-dimensional Bayesian inversion with different constraints. *IEEE TGRS*, vol. 62, pp. 1-16. doi:[10.1109/TGRS.2024.3382106](https://doi.org/10.1109/TGRS.2024.3382106).
9. Li L., Xiao E., **Wei, X.**, Qiu N., Latif K., Guo J. and Sun B., 2023. Crustal Imaging across the Princess Elizabeth Land, East Antarctica from 2D Gravity and Magnetic Inversions. *Remote Sensing*, 15(23):5523. doi:[10.3390/rs15235523](https://doi.org/10.3390/rs15235523).
8. Hu, Y., **Wei, X.**, Wu, X., Sun, J., Chen, J., Huang, Y. and Chen, J., 2023. 3D cooperative inversion of airborne magnetic and gravity gradient data using deep learning techniques. *Geophysics*, 89(1), pp.WB67-WB79. doi:[10.1190/geo2023-0225.1](https://doi.org/10.1190/geo2023-0225.1).
7. Hu, Y., **Wei, X.**, Wu, X., Sun, J., Chen, J., Huang, Y. and Chen, J., 2023. A deep learning enhanced framework for multi-physics joint inversion. *Geophysics*, 88(1), pp.1-70. doi:[10.1190/geo2021-0589.1](https://doi.org/10.1190/geo2021-0589.1).
6. **Wei, X.**, Sun, J. and Sen, M., 2023. Quantifying uncertainty of salt body shapes recovered from gravity data using trans-dimensional Markov chain Monte Carlo sampling. *Geophysical Journal International*, 232(3), pp.1957-1978. doi:[10.1093/gji/ggac430](https://doi.org/10.1093/gji/ggac430).
5. **Wei, X.**, Li, K. and Sun, J., 2022. Mapping critical mineral resources using airborne geophysics, 3D joint inversion and geology differentiation: A case study of a buried niobium deposit in the Elk Creek carbonatite, Nebraska, USA. *Geophysical Prospecting*, 71(Special Issue: Mineral Exploration and Mining Geophysics), pp.1247-1266. doi:[10.1111/1365-2478.13280](https://doi.org/10.1111/1365-2478.13280).
4. **Wei, X.** and Sun, J., 2022. 3D probabilistic geology differentiation based on airborne geophysics, mixed Lp norm joint inversion and petrophysical measurements. *Geophysics*, 87(4), pp.1-67. doi:[10.1190/geo2021-0833.1](https://doi.org/10.1190/geo2021-0833.1). **Nominated by editors to be highlighted in Geophysics Bright Spots in The Leading Edge** ([link](#)).
3. **Wei, X.** and Sun, J., 2021. Uncertainty analysis of 3D potential-field deterministic inversion using mixed L p norms. *Geophysics*, 86(6), pp.G133-G158. doi:[10.1190/geo2020-0672.1](https://doi.org/10.1190/geo2020-0672.1).
2. Sun, J. and **Wei, X.**, 2020. Recovering sparse models in 3D potential-field inversion without bound dependence or staircasing problems using a mixed Lp-norm regularization. *Geophysical Prospecting*, 69(4), pp.901-910. doi:[10.1111/1365-2478.13063](https://doi.org/10.1111/1365-2478.13063).
1. Sun, J., Melo, A., Kim, J.D. and **Wei, X.**, 2020. Unveiling the 3D undercover structure of a Precambrian intrusive complex by integrating airborne magnetic and gravity gradient data into 3D quasi-geology model building. *Interpretation*, 8(4), pp.1-50. doi:[10.1190/INT-2019-0273.1](https://doi.org/10.1190/INT-2019-0273.1).

Conference proceedings

14. **Wei, X.**, Yin, Z. and Caers, J., 2024, August. Falsification of magmatic intrusion models using outcrops, drillholes, and geophysics. In *International Workshop on Gravity, Electrical & Magnetic Methods and Their Applications*, (pp. 364-367). doi:doi.org/10.1190/GEM2024-091.1.

13. Sun, J. and **Wei, X.**, 2024, August. Quantifying uncertainty in 3D geophysical inverse problems: Advancing from deterministic to Bayesian and deep generative models. In *International Workshop on Gravity, Electrical & Magnetic Methods and Their Applications*, (pp. 335-338). doi:[10.1190/GEM2024-084.1](https://doi.org/10.1190/GEM2024-084.1).
12. Guo, R., Zhou, H., **Wei, X.**, Lin, Z., Li, M., Eldar, Y., Yang, F., Xu, S. and Abubakar, A., 2024, August. Deep joint inversion of electromagnetic, seismic, and gravity data. In *International Workshop on Gravity, Electrical & Magnetic Methods and Their Applications*, (pp. 360-363). doi:[10.1190/GEM2024-090.1](https://doi.org/10.1190/GEM2024-090.1).
11. Yang, C., **Wei, X.**, Liu, B., Sun, G., Dong, J.E., Sun, L., Tang, X., Li, B. and Ye, G., 2024, August. Targeting potential mineral deposits via uncertainty analysis of magnetic inversions. In *International Workshop on Gravity, Electrical & Magnetic Methods and Their Applications*, (pp. 224-227). doi:[10.1190/GEM2024-056.1](https://doi.org/10.1190/GEM2024-056.1).
10. Hu, Y., Wu, X., Sun, J., Huang, Y., Chen, J. and **Wei, X.**, 2024, July. Deep Learning Framework for Multi-Physics Joint Inversion and its Application in the Decorah Area. In *IGARSS 2024-2024 IEEE International Geoscience and Remote Sensing Symposium* (pp. 6933-6937). IEEE. doi:[10.1109/IGARSS53475.2024.10640431](https://doi.org/10.1109/IGARSS53475.2024.10640431).
9. Hu, Y., **Wei, X.**, Wu, X., Sun, J., Huang, Y. and Chen, J., 2023, August. 3D Joint Inversion of Multi-physics Data Using Deep Learning Techniques. In *2023 XXXVth General Assembly and Scientific Symposium of the International Union of Radio Science (URSI GASS)* (pp. 1-4). IEEE. doi:[10.23919/URSIGASS57860.2023.10265612](https://doi.org/10.23919/URSIGASS57860.2023.10265612).
8. **Wei, X.**, Sun, J. and Sen, M., 2022. Trans-dimensional Bayesian gravity inversion and uncertainty analysis for salt reconstruction. In *IMAGE Technical Program Expanded Abstracts 2022*. doi:[10.1190/image2022-3746659.1](https://doi.org/10.1190/image2022-3746659.1).
7. **Wei, X.** and Sun, J., 2021. 3D probabilistic geology differentiation using mixed L_p norm joint inversion constrained by petrophysical information. In *IMAGE Technical Program Expanded Abstracts 2021*. doi:[10.1190/segam2021-3586619.1](https://doi.org/10.1190/segam2021-3586619.1). **Best Student Paper in the Mining Sessions.**
6. **Wei, X.** and Sun, J., 2021. Uncertainty analysis of 3D geophysical inversion using airborne gravity gradient data conditioned on rock sample measurements. In *IMAGE Technical Program Expanded Abstracts 2021*. doi:[10.1190/segam2021-3586552.1](https://doi.org/10.1190/segam2021-3586552.1).
5. Hu, Y., **Wei, X.**, Wu, X., Sun, J., Chen, J., Chen, J., Huang, Y., 2021. Deep learning-enhanced multiphysics joint inversion. In *IMAGE Technical Program Expanded Abstracts 2021*. doi:[10.1190/segam2021-3583667.1](https://doi.org/10.1190/segam2021-3583667.1).
4. Li, K., **Wei, X.**, Sun, J., 2021. Geophysical characterization of a buried niobium and rare earth element deposit using 3D joint inversion and geology differentiation: A case study on the Elk Creek carbonatite2021. In *IMAGE Technical Program Expanded Abstracts 2021*. doi:[10.1190/segam2021-3585069.1](https://doi.org/10.1190/segam2021-3585069.1). **Best Paper in the Mining Sessions.**
3. **Wei, X.** and Sun, J., 2020. Uncertainty analysis of joint inversion using mixed L_p -norm regularization. In *SEG Technical Program Expanded Abstracts 2020* (pp. 925-929). Society of Exploration Geophysicists. doi:[10.1190/segam2020-3428359.1](https://doi.org/10.1190/segam2020-3428359.1).
2. **Wei, X.** and Sun, J., 2020. Quantifying uncertainties of deterministic geophysical inversions using mixed L_p norms. In *SEG Technical Program Expanded Abstracts 2020* (pp. 1404-1408). Society of Exploration Geophysicists. doi:[10.1190/segam2020-3420227.1](https://doi.org/10.1190/segam2020-3420227.1). **Best Poster in the Mining Sessions.**

1. Sun, J., Melo, A., Deok Kim, J. and **Wei, X.**, 2020. Characterizing a Precambrian intrusive complex by integrating potential field data into 3D quasi-geology model building. In *SEG Technical Program Expanded Abstracts 2020* (pp. 1374-1378). Society of Exploration Geophysicists. doi:[10.1190/segam2020-3428385.1](https://doi.org/10.1190/segam2020-3428385.1).

Conference abstracts

9. **Wei, X.**, Yin, Z., Schedit, C., Darnell, K., Wang, L. ad Caers, J., 2023, December. Quantifying uncertainty for sediment-hosted mineral deposits using multiple geoscientific observations and Bayesian evidential learning. In *AGU Fall Meeting Abstracts*.
8. Sun, J., and **Wei, X.**, 2023, August. Mapping critical mineral resources using multiphysics inversion. In *IMAGE Technical Program Abstracts 2023*.
7. Hu, Y., **Wei, X.**, Wu, X., Sun, J., Chen, J., Chen, J., Huang, Y., 2023, August. Deep learning enhanced joint inversion for mineral exploration using airborne geophysics: Application in Decorah area. In *IMAGE Technical Program Abstracts 2023*.
6. **Wei, X.**, Sun, J. and Sen, M., 2023, August. 3D trans-dimensional Monte Carlo geometry inversion and uncertainty quantification using gravity data. In *IMAGE Technical Program Abstracts 2023*.
5. Sun, J., **Wei, X.** and Sen, M., 2023, August. Uncertainty quantification of anomalous body shapes using potential field data in a trans-dimensional Bayesian framework, *XXVIII General Assembly of the International Union of Geodesy and Geophysics (IUGG)* (Berlin 2023). doi:[10.57757/IUGG23-4343](https://doi.org/10.57757/IUGG23-4343).
4. **Wei, X.**, Sun, J. and Sen, M., 2022, December. A Bayesian framework for uncertainty analysis of anomalous body shapes using gravity data. In *AGU Fall Meeting Abstracts* (Vol. 2022, pp. NG35B-0469).
3. **Wei, X.** and Sun, J., 2021, December. Building 3D probabilistic geology differentiation models using mixed Lp norm joint inversion, airborne geophysics and petrophysical information. In *AGU Fall Meeting Abstracts* (Vol. 2021, pp. NG25A-0485).
2. **Wei, X.** and Sun, J., 2021, December. Analyzing uncertainty of 3D inversion using airborne geophysical data conditioned on petrophysical measurements. In *AGU Fall Meeting Abstracts* (Vol. 2021, pp. NS35C-0373).
1. Li, K., **Wei, X.**, Sun, J., 2021, December. Characterizing a buried niobium deposit using airborne geophysics, joint inversion, and geology differentiation. In *AGU Fall Meeting Abstracts* (Vol. 2021, pp. NS24A-05).

Open code and data

3. **Wei, X.** and Sun, J., 2021. Joint inversion of gravity gradient and magnetic data using mixed Lp norm regularization (1.0). *Zenodo*. doi:[10.5281/zenodo.5774303](https://doi.org/10.5281/zenodo.5774303).
2. **Wei, X.** and Sun, J., 2021. Interactive geology differentiation and 3D visualization of geological units (1.0). *Zenodo*. doi:[10.5281/zenodo.5774309](https://doi.org/10.5281/zenodo.5774309).
1. Sun, J., and **Wei, X.**, 2020. Solving the bound dependence and staircasing problems in 3D potential-field sparse inversions using a mixed Lp-norm regularization (1.0). *Zenodo*. doi:[10.5281/zenodo.4057134](https://doi.org/10.5281/zenodo.4057134).

Invited Talks

- 09/2024 **Wei, X.**, AI and ML for mineral exploration discussion panel. Houston, USA. *IMAGE Near Surface Geophysics Technical Sessions*.
- 09/2024 **Wei, X.**, Yin, Z. and Caers, J., A New Role for Geophysics in Mineral Exploration: Falsification of Geological Hypotheses. Houston, USA. *IMAGE Post-Convention Workshop*.
- 09/2024 **Wei, X.**, Building on Dr. Talwani’s foundations: New directions in 3D geophysical geometry inversion techniques. Houston, USA. *IMAGE Post-Convention Workshop W11: Manik Talwani Memorial Workshop*.
- 09/2023 **Wei, X.**, Yin, Z., Scheidt, C., Darnell, K., Wang, L. and Caers, J., Uncertainty quantification of the stratigraphic model conditioned on airborne geophysics, geochemistry, and drillholes. Houston, USA. *IMAGE Post-Convention Workshop W7*.
- 07/2023 Sun, J., and **Wei, X.**, Building probabilistic quasi-geology models and mapping mineral resources using joint inversion and geology differentiation. Berlin, Germany. doi:[10.57757/IUGG23-4333](https://doi.org/10.57757/IUGG23-4333). *IUGG*.
- 09/2022 **Wei, X.**, Sun, J. and Sen, M., A Bayesian framework for uncertainty quantification of salt body shapes using gravity data. Houston, USA. *Geophysical Society of Houston*.
- 11/2021 **Wei, X.** and Sun, J., Build probabilistic quasi-geology models based on multiple airborne geophysical data and sparse joint inversions. Online. *Geophysical Society of Houston*.
- 09/2021 **Wei, X.** and Sun, J., From deterministic to probabilistic geoscience modeling: analyzing uncertainties of geophysical inversions and constructing probabilistic subsurface models conditioned on petrophysical measurements. Online. *SimPEG monthly seminar*.

Teaching Experience

- 2020 GEOL7330: Potential Field Methods of Geophysical Exploration (graduate core course), **guest lecturer**. *University of Houston*.
- 2019 GEOL4355: Geophysical Field Camp, **teaching assistant**. *University of Houston*.

Mentoring Experience

- 2024–present Abdelaziz Zine: PhD visiting student from Mohammed VI Polytechnic University (UM6P). *Stanford University*.

Awards & Honors

2022	Dan E. Wells Outstanding Dissertation Award, University of Houston (link)
2022	The Innovation Prize in Frank Arnott - Next Generation Explorers Award (\$3,000CAD)
2022	SEG Lucien LaCoste Scholarship (\$5,305.12)
2022	Outstanding Graduate Work in Geophysics, University of Houston (\$1,250)
2022	The Best Paper in the Mining Sessions at 2021 IMAGE Annual Meeting, Denver, USA (co-author)
2022	The Best Student Paper in the Mining Sessions at 2021 IMAGE Annual Meeting, Denver, USA
2021	Student Travel Award, University of Houston, Houston
2021	SEG Technical Program Registration Grant
2021	SEG John R. Butler Jr. Scholarship (\$510.86)
2021	The Best Poster in the Mining Sessions at 2020 SEG Annual Meeting, Online
2020–2021	Student Research Funding Program (independent of advisor) from EAS Department at University of Houston
2020–2021	Outstanding Academic Achievement, University of Houston (\$700×2)
2016–2018	The First Prize Scholarship, Northwest University, Xi'an, China (×3)
2015	The Best Bachelor Thesis, China University of Geosciences, Beijing, China
2013	The Second Prize Scholarship, China University of Geosciences, Beijing, China

Professional Service & Outreach

Editorial Service

2024–present	Guest Associate Editor for GEOSCIENCES special section: Geophysical Inversion
2023–present	Guest Associate Editor for GEOPHYSICS special section: Frontiers in Electromagnetic Geophysics

Peer-Reviewer

2024–present	Ore Geology Reviews
2024–present	Surveys in Geophysics
2024–present	Near Surface Geophysics
2023–present	Geophysical Prospecting
2023–present	Solid Earth
2022–present	Geocarto International
2021–present	SEG Conference Proceeding

2021–present	Geophysics
2021–present	Geophysical Journal International
2021–present	IEEE Transactions on Geoscience and Remote Sensing
2021–present	Acta Geophysica

Organizations and Conferences

2024–present	Key Technical Contact of SEG Mining & Mineral Exploration (MME) Committee
2023–2025	Society of Exploration Geophysicists (SEG) Research Committee Early-career (RCEC) subcommittee
2024	Session Chair for GM P2: Applications in Processing and Interpretation at IMAGE Annual Meeting, Houston, Texas, USA
2024	Session Chair for EM P2: Inversion at IMAGE Annual Meeting, Houston, Texas, USA
2023	Session Co-convenor: Advancing Mineral Exploration and Responsible Mining for Energy Transitions, AGU, San Francisco, California, USA
2023	Session Chair for MME 1: Mineral Exploration: Geophysics 1 at IMAGE Annual Meeting, Houston, Texas, USA
2022	Session Chair for GM 1: Inversion Insights at IMAGE Annual Meeting, Houston, Texas, USA
2021	Session Chair for MG P1: New Methods and Case Histories 1 at IMAGE Annual Meeting (SEG and AAPG joint annual conference), Denver, Colorado, USA

Affiliations

2024–Present	Geoscience and Remote Sensing Society (GRSS)
2024–Present	Institute of Electrical and Electronics Engineers (IEEE)
2022–Present	European Geosciences Union (EGU)
2021–Present	Geophysical Society of Houston (GSH)
2020–Present	American Geophysical Union (AGU), European Association of Geoscientists & Engineers (EAGE)
2018–Present	Society of Exploration Geophysicists (SEG)

Others

2020–2021	Contributor of the joint inversion code to SimPEG (https://simpeg.xyz/)
-----------	---

Certifications

2022	Remote pilot for the small unmanned aircraft system issued by Federal Aviation Administration
2021	FAA Part 107 Knowledge Test Prep for Drone Pilot on Udemy, Inc.
2021	ISInProG@Lario - 2021 International School on Inverse Problems in Geophysics on the shore of the Lario Lake