



EMPLOYMENT

2026 - Present **Postdoctoral Researcher (in Physical Oceanography)** **Laoshan National Laboratory**

EDUCATION

2021 - 2026 **Center for Data Science, Academy for Advanced Interdisciplinary Studies** **Peking University, China**
Ph.D. in Data Science

2016 - 2020 **College of Sciences** **China Jiliang University, China**
B.S. in Information and Computing Science

RESEARCH INTERESTS

My research interests include *data fusion and data assimilation*, *high-dimensional statistics*, and *physics-informed statistical learning*, motivated by applications in Earth and ocean sciences.

- **Data fusion and data assimilation:** Developing statistically principled methods for integrating heterogeneous observations into dynamical Earth and ocean systems, with an emphasis on building scalable data assimilation systems for large-scale, real-world deployment.
- **Physics-informed statistical learning:** Leveraging prior physical knowledge to guide statistical modeling by incorporating physics-based constraints (e.g., via loss/regularization), while using stochastic-process models to represent and quantify the uncertain components of physical processes.
- **High-dimensional statistics under computational constraints:** Investigating the optimality of high-dimensional ($n \ll p$) methods under computational constraints, particularly for large-scale data with latent structure, such as those arising in Earth sciences.

My future research aims to develop deployable methods for Earth-system modeling, centered on data assimilation and real-time decision-making, to support ocean prediction, climate analysis, and carbon-flux estimation, and to advance Digital Twin Earth.

PROJECTS AND INTERDISCIPLINARY EXPERIENCE

Multi-sphere Interaction Data Integration in Western Pacific Ocean

2023–Present

- Development of a North Pacific ocean data assimilation and forecasting system:
 - Integrated high-dimensional statistical methods into ocean data assimilation using blockwise, multigrid, and spatially localized weighting strategies, combined with physical constraints from Navier–Stokes equations, overcoming computational and theoretical bottlenecks in high-resolution assimilation.
 - Achieved assimilation skill superior to state-of-the-art benchmark from Mercator Ocean International.
 - Established an end-to-end operational workflow (observation quality control, assimilation, forecast, evaluation), now stably running on the Laoshan National Laboratory supercomputing platform.
- Design and execution of a targeted eddy observation experiment in the Western Pacific:
 - Developed real-time ocean current estimation and data-driven experimental design with adaptive control of autonomous platforms, enabling tight coupling between observation and prediction.

- Achieved the first fine-scale networked observation, to our knowledge, of a mesoscale eddy.

High-resolution Ensemble Kalman Filter and Carbon Flux Fused Algorithm 2022–Present

- Development of a global carbon-flux data assimilation system:
 - Proposed a multi-inflation strategy to jointly assimilate satellite and in situ CO₂ observations, adaptively accounting for observational heterogeneity and improving inversion stability and accuracy beyond existing benchmark products (e.g., CarbonTracker).
 - Coupled with the global atmospheric chemistry transport model GEOS-Chem to perform high-resolution global carbon-flux inversion and quantify terrestrial and oceanic carbon sinks.
 - Provided systematic uncertainty diagnostics to support carbon budget accounting and emission assessment; this work received a nomination for the Eni Award.

PUBLICATIONS AND PAPERS UNDER REVIEW

- **Su, W.**, Li, H., Jing, Z., Qiu, Y. and Chen, S.X. (2026+). Physics-informed Statistical Data Fusion for Reconstructing 3D Current Fields of Oceanic Eddies. Minor revision for *Journal of the American Statistical Association*.
- **Su, W.** and Qiu, Y. (2026+). High-dimensional Clustering and Signal Recovery under Block Signals. Moderate revision for *Journal of the American Statistical Association*. [\[arxiv\]](#)
- **Su, W.**, Wang, B., Chen, H., Zhu, L., Zheng, X. and Chen, S.X. (2024). A new global carbon flux estimation methodology by assimilation of both in situ and satellite CO₂ observations. *npj Climate and Atmospheric Science*, 7:287. [\[link\]](#)[\[pdf\]](#)
- **Su, W.**, E, X., Jing, Z. and Chen, S.X. (2026). Glider Path Design and Control for Reconstructing Three-Dimensional Structures of Oceanic Mesoscale Eddies. *Proceedings of the Royal Society A*, 482(2333):20250533.[\[link\]](#)
- Du, T., Zhang, Y., **Su, W.**, Jing, Z., Chen, Z., Qiu, Y., Zhang, H., Yang, S. and Ma, W. (2025). Three-Dimensional Observations of a Mesoscale Eddy in the Kuroshio Extension Based on Multiple Platforms. *Scientific Data*. 12: 2013. [\[link\]](#)[\[pdf\]](#)
- Qian, L., **Su, W.**, Huang, Y., and Chen, S.X. (2026+). Likelihood Matching for Diffusion Models. Accepted. [\[arxiv\]](#)
- Tong, P., **Su, W.**, Li, H., Ding, J., Zhan, H. and Chen, S.X. (2023). Distribution Free Domain Generalization. *Proceedings of the 40th International Conference on Machine Learning (ICML 2023)*, 202:34369–34378. [\[link\]](#)[\[pdf\]](#)
- Weng, Z., Zhu, L., Li, J., Zhang, Y., Liu, X., **Su, W.**, Sun, H., Li, X. (2025). Using EnKF Data Assimilation to Improve Predictions of Volcanic Ash Dispersion. *Journal of Geophysical Research: Atmospheres*, 130:e2024JD042215. [\[link\]](#)[\[pdf\]](#)

PREPRINTS

- Horvath, B., Su, Wen, **Su, Wu**, Wang, B., and Zhang, R. (in alphabetical order) (2026+). How Fast Do Signatures Learn? Statistical Theory and Applications for Path Regression. [\[arxiv\]](#)

INVITED TALKS

- **Minimax Optimal Clustering under Block Signals and Computational Constraint**
 - 2025/07 The third Joint Conference on Statistics and Data Science in China (Hangzhou, China)
- **Glider Path Design and Control for Surveying an Oceanic Eddy**
 - 2026/07 The fourth Joint Conference on Statistics and Data Science in China (Guiyang, China)
 - 2026/01 First Symposium on Ocean Statistics and Data Science (Xiamen, China)
 - 2024/11 The 12th National Probability and Statistics Conference of China (Xiamen, China)
- **Multi-source Observation Global Carbon Flux Estimation using EnKF**
 - 2024/07 The second Joint Conference on Statistics and Data Science in China (Kunming, China)
 - 2025/04 *Invited seminar*, National Satellite Meteorological Center (Beijing, China).

AWARDS AND HONORS

2024	Excellent Poster in Peking-Tsinghua statistical forum
2023	Learning Excellence Award, Peking University
2019	First Class Scholarship, China Jiliang University
	First Prize in the China Undergraduate Mathematical Contest in Modeling
	First Prize in the 7th "TiPDM cup" Data Mining Competition
	First Prize in the Chinese Mathematics Competitions
2018	Merit Student, China Jiliang University

SKILLS

- Programming: Python (advanced), MATLAB (advanced), R, $\text{\LaTeX}$.
- Languages: Mandarin (native), English (fluent).
- High-Performance Computing: Supercomputing platforms (Linux), PyTorch distributed training