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Education & Experience

09/2022-present PhD student in Hydraulic Engineering Sun Yat-sen University

Planned dissertation: *Tracking Heatwaves in Southern China under Global Warming: A Lagrangian View*. Supervised by Dr. Bingjun Liu and Dr. Xuezhi Tan.

07/2019-12/2020 Assistant Engineer Guangdong Water Conservancy Design and Research Institute

Participated projects: *Site Selection Planning of Pumped Storage Power Stations in Guangdong Province*; *Water Supply Security Planning for Dongguan City*.

09/2017-07/2019 M.Sc. in Hydraulic Engineering Sun Yat-sen University

Master's Thesis: *Spatio-temporal Evolution Characteristics of Drought in Eastern Monsoon Area of China*. Supervised by Dr. Bingjun Liu.

07/2013-06/2017 B.Sc. in Hydraulic and Hydropower Engineering South China University of Technology

Bachelor's Thesis: *Spatial and Temporal Variation of Evapotranspiration and Driving Factors in the Main Grain Production Area of China*. Supervised by Dr. Zhaoli Wang.

Research Interests

I am currently a 2nd-year PhD student who is particularly interested in multi-disciplinary climate change fields. My research topics aim to understand the role of water and the associated hydrological processes in regulating global environmental changes in the present and future. While much of my research focuses on the changes in climate extremes, e.g., extreme precipitation, heatwaves, floods, and wildfires, I am also interested in how these extremes affect the ecology, human, and socioeconomic systems. Besides the traditional analyzing methods, I am very enthusiastic about using the knowledge of artificial intelligence approaches to comprehend the causes and consequences of these hydrological extremes.

Understanding the Spatial and Temporal Evolutions of Heatwaves from A Lagrangian Perspective: the Associated Physical Mechanisms and the Roles of Anthropogenic Warming

- Identifying heatwaves of different types (e.g., dry heatwaves versus moist heatwaves, daytime heatwaves versus nighttime heatwaves), and tracking the air particle trajectories associated with specific heatwaves.
- Quantifying the contribution of different physical processes to specific heatwave events of different types based on the trajectory results.
- Understanding how climate warming will influence the physical mechanisms associated with different heatwave types by using Pseudo Global Warming (PGW) with the help of WRF simulations.

Quantifying Long-term Contributions of Atmospheric Changes and Anthropogenic Warming and the Physical Processes leading to the 2022 Yangtze River Basin Heatwave

- Quantifying how unprecedented is the 2022 YRB heatwave by using some statistics methods (return period and trend).
- Estimating contributions of anthropogenic warming and atmospheric circulation changes on the long-term changes of the YRB summer hot extreme by using the ensemble constructed circulation analogs (CCAs).

Understanding the Spatial and Temporal Interpretability of a Deep-learning Approach in Regional Hydrological Modeling

- Simulating regional daily streamflow across a region characterized by different flooding types using a convolutional long short-term memory network.
- Understanding the global and local interpretability of the deep-learning approach from a temporal-spatial perspective using a game theoretic approach (Shapley Additive exPlanations, SHAP).

Publications

1. **Huang, Z.**, X. Wu, J. Fu, X. Tan, X. Cai, X. Tan, B. Liu. "Anthropogenic Impacts and La Niña Events Contribute to the 2020~2023 Continuous Extreme Snow Droughts in the Tibetan Plateau." (proposal to *BAMS EEE Special Report)*
2. **Huang, Z.**, X. Tan, T. Y. Gan, B. Liu, and X. Chen, 2023: Thermodynamically enhanced precipitation extremes due to counterbalancing influences of anthropogenic greenhouse gases and aerosols. *Nat Water*, https://doi.org/10.1038/s44221-023-00107-3.
3. **Huang, Z.**, X. Tan, X. Wu, X. Tan, J. Fu, and B. Liu, 2023: Long-Term Changes, Synoptic Behaviors, and Future Projections of Large-Scale Anomalous Precipitation Events in China Detected by a Deep Learning Autoencoder. *Journal of Climate*, **36**, 4133–4149, https://doi.org/10.1175/JCLI-D-22-0737.1.
4. **Huang, Z.**, X. Tan, and B. Liu, 2024: Relative Contributions of Large-Scale Atmospheric Circulation Dynamics and Anthropogenic Warming to the Unprecedented 2022 Yangtze River Basin Heatwave. *JGR Atmospheres*, **129**, e2023JD039330, https://doi.org/10.1029/2023JD039330.
5. Liu, B., **Z. Huang**, X. Chen, and Z. Wang, 2019: Effects of large-scale climate anomalies on crop reference evapotranspiration in the main grain-production area of China. *Int J Climatol*, **39**, 1195–1212, https://doi.org/10.1002/joc.5871.

Conference/Workshop Presentation

1. **Huang, Zeqin**, Xuezhi Tan. *Long-Term Changes, Synoptic Behaviors, and Future Projections of Large-Scale Anomalous Precipitation Events in China Detected by a Deep Learning Autoencoder*, The 20th Asia Oceania Geosciences Society (AOGS), Singapore, 2023.
2. **Huang, Zeqin.** *Identifying and Understanding the Large-Scale Anomalous Precipitation Events in China,* The 8th Youth Geosciences Forum, Wuhan, 2023.

Skills

Computer skills:	Python; R; MATLAB; GEE; QGIS; ArcGIS
Statistical analysis skills:	Time-series and geo-statistics; nonstationary analysis; copula; machine learning; optimal fingerprint analysis
Hydrology and climate model skills:	HYSPLIT (in learning); SWAT; HBV; WRF (in learning)

Honors and Awards

The President Scholarship (1/16)	Sun Yat-Sen University	Sep. 2023
The 1st Prize PhD Scholarship (1/16)	Sun Yat-Sen University	Sep. 2022
The 1st Prize of the 2nd Smart Water Conservancy Innovation Competition (1/32)	Guangdong Hydraulic Engineering Society	Dec. 2022
The 2nd Prize Master Scholarship (2/30)	Sun Yat-Sen University	Sep. 2018
National Endeavor Scholarship (1/51)	South China University of Technology	Sep. 2016