RRL

Poyang Lake, a globally recognized river-connected lake, is not only China’s largest freshwater lake but also one of the most remarkable lakes in Northeast Asia. Throughout the year, Poyang Lake experiences a seasonal water level fluctuation exceeding 10 m, presenting a unique hydrological phenomenon where the lake transforms into a river and then reverts back to a lake form13. However, since the twenty-first century, the dry seasons of Poyang Lake have been advancing and prolonging gradually.

Studying the relationship between water level and water quality in lakes is crucial due to the nonlinear and cumulative nature of changes in the hydrological environment. Previous studies have examined this relationship, but the findings have been inconsistent. For instance, studies on river-connected lakes like Poyang Lake and Dongting Lake have shown a negative correlation between water level and the concentration of nitrogen and phosphorus nutrients, However, these studies have overlooked the potential nonlinear changes within this relationship. Wavelet correlation analysis (WTC) has emerged as a valuable tool for identifying nonlinear temporal patterns in hydrological and environmental responses to address this issue. WTC analyses have indicated that the correlation between water level and nutrient concentration in rivers and lakes is nonlinear20. In particular, the study on large river-connected lakes has shown that the hydrological conditions and water quality do not always follow a stable one-way response mechanism. Te substantial increase in hydrological fluctuation amplitude can significantly impact the relationship between water level and water quality. However, although WTC provides insights into the nonlinear aspect, it does not explain spatial heterogeneity. Therefore, it is necessary to explore the spatial distribution differences and evolutionary processes of the response relationship in a scientific and visually appealing manner. [1]

Water quality is classified using a single-factor method, which means a parameter that exceeds its corresponding criterion with the highest proportion is selected for water-quality-level classification. Five water-quality levels were defined by GB3838-2002. In situ sampling and measurements are one of the water-quality monitoring methods. Manual measurement and automatic monitoring belong to this kind of water-quality monitoring method. Most published water-quality parameters come from in situ sampling and measurement, and water-quality levels are calculated in terms of water-quality parameters. No matter whether manual or automatic water-quality measurement, the cost is high, limiting the usage of in situ sampling and measurement. Optimization of a monitoring network is considered a trade-off between water-monitoring precision and cost [2]

References

[1] Yin, Y., Xia, R., Liu, X., Chen, Y., Song, J., & Dou, J. (2024). Spatial response of water level and quality shows more significant heterogeneity during dry seasons in large river-connected lakes.*Scientific Reports (Nature Publisher Group), 14*(1), 8373. doi:https://doi.org/10.1038/s41598-024-59129-w

[2] Pu, F., Ding, C., Chao, Z., Yu, Y., & Xu, X. (2019). Water-quality classification of inland lakes using Landsat8 images by convolutional neural networks.*Remote Sensing, 11*(14) doi:https://doi.org/10.3390/rs11141674