Characterizing Changes of Key Hydrological Elements in Poyang lake Based on Multi-source Remote Sensing Data

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ABSTRACT

In the past 20 years, under the influence of global climate change and human activities, the relationship between rivers and lakes in the middle and lower reaches of the Yangtze River has continued to be adjusted, and the hydrological rhythm of Poyang Lake has changed dramatically. Climate change has led to extreme hydrological events in Poyang Lake. In 2020, over-standard flooding occurred in the Yangtze River, and in 2022, the Yangtze River Basin experienced a historically rare event of " returning to dryness during flood season". During November 2022, Poyang Lake suffered from a severe drought disaster, and the water level at Xingzi Station receded to 6.46 meters, which set a new record low water level. Since 2023, the overall water level of Poyang Lake has continued to be low.

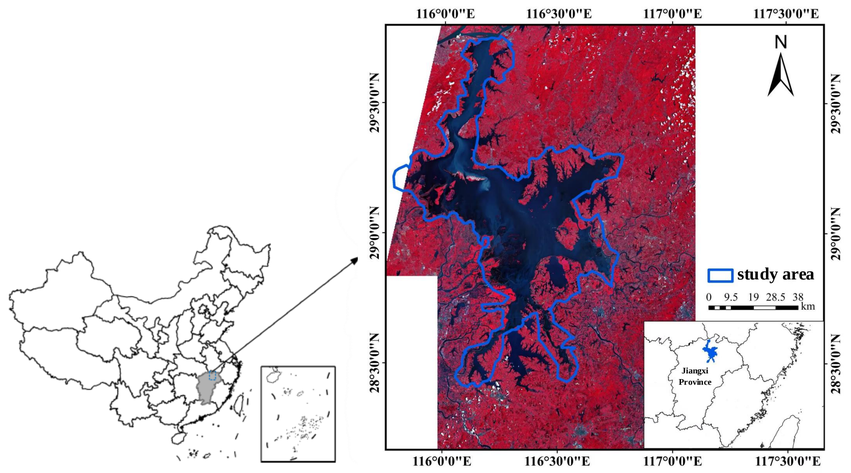
In order to explore the impacts of these extreme hydrological events on the hydrological rhythm of Poyang Lake, we used multi-source remote sensing satellite data (Sentinel-1, Sentinel-2, ICESat-2, etc.) to carry out high spatial-temporal resolution and all-weather monitoring of key hydrological elements (water level, water area, water storage, etc.) , and verified the results with the hydrological station data. 1) We found that the water level and water area showed strong correlation in recent years, especially at Xingzi station (R2=0.88). 2) The optimal RMSE between ICESat-2 data and hydrological station data after error correction is 0.625m, furthermore, we realized the detection of water level change in seasonal lakes of Poyang Lake by ICESat-2. Under the background of the lack of hydrological stations and continuous monitoring data, we characterized the change pattern of water level and area of seasonal lakes in recent years, which provided data support for the changes of food and habitat environment of migratory birds. 3) For purpose of assessing the drought disaster in Poyang Lake more accurately, we carried out the research on the precise classification of land cover. Our research results can provide decision support for the relevant management departments for disaster early warning and assessment of Poyang Lake.

INTRODUCTION

Poyang Lake is the largest freshwater lake in China, which plays an irreplaceable ecological service function in terms of water conservation, regulating Yangtze River floods, adjusting the climate, and providing biological habitats. Due to the complex relationship between rivers and lakes, Poyang Lake has always been one of the most serious areas of flood and drought disasters in China, the lake area has shrunk, and the wetland ecosystem function has been degraded.

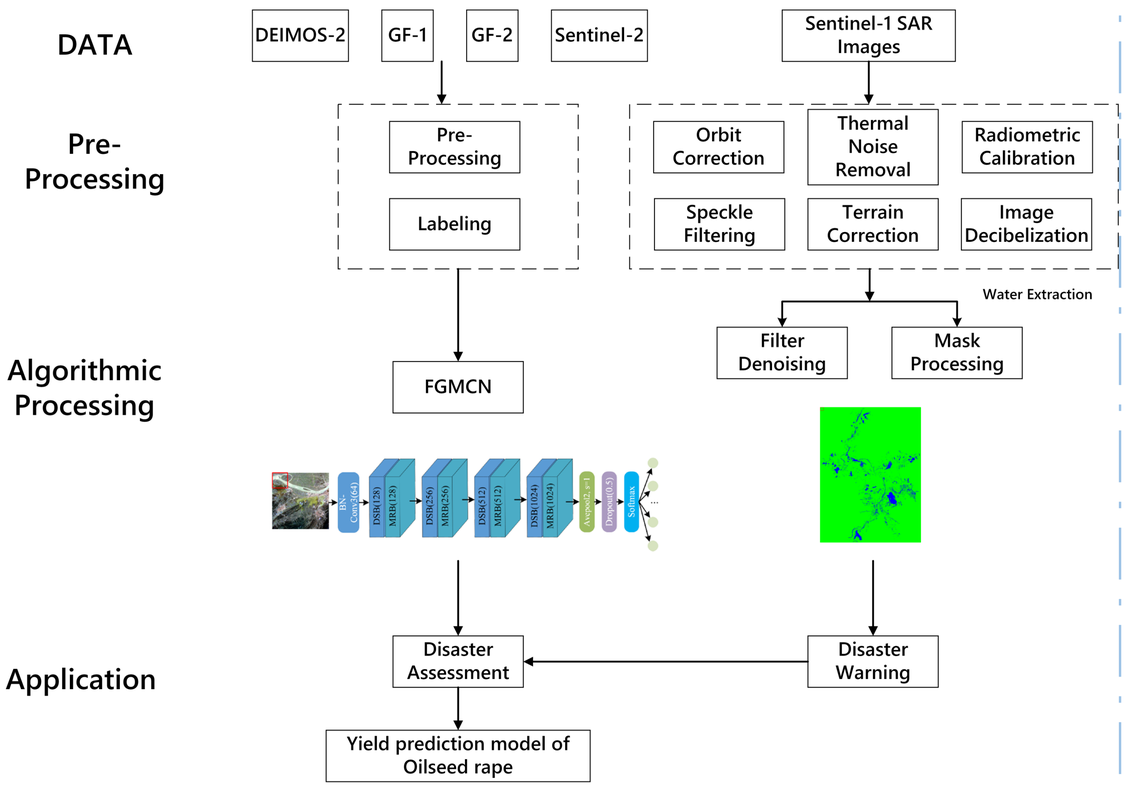
Understanding the hydrological patterns of floods and droughts in Poyang Lake and the precise classification of feature classes are of great significance for early warning and disaster assessment in Poyang Lake.

OBJECTIVE



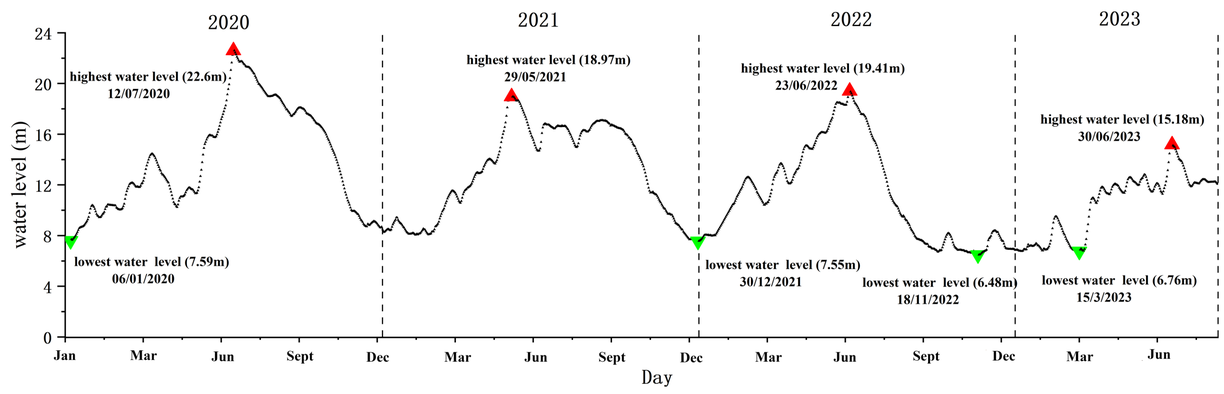
1. How is the hydrological pattern of Poyang Lake in recent years?
2. How to realize the precise classification of land cover in Poyang Lake?

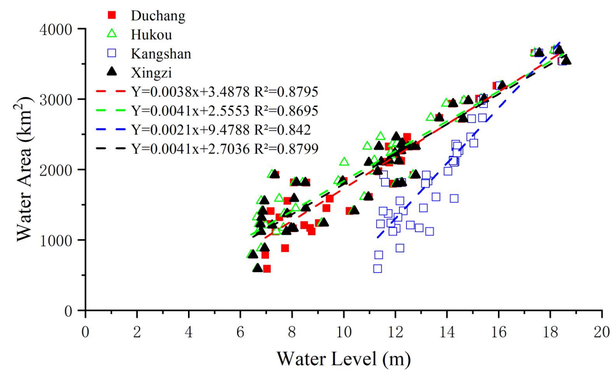
METHODS



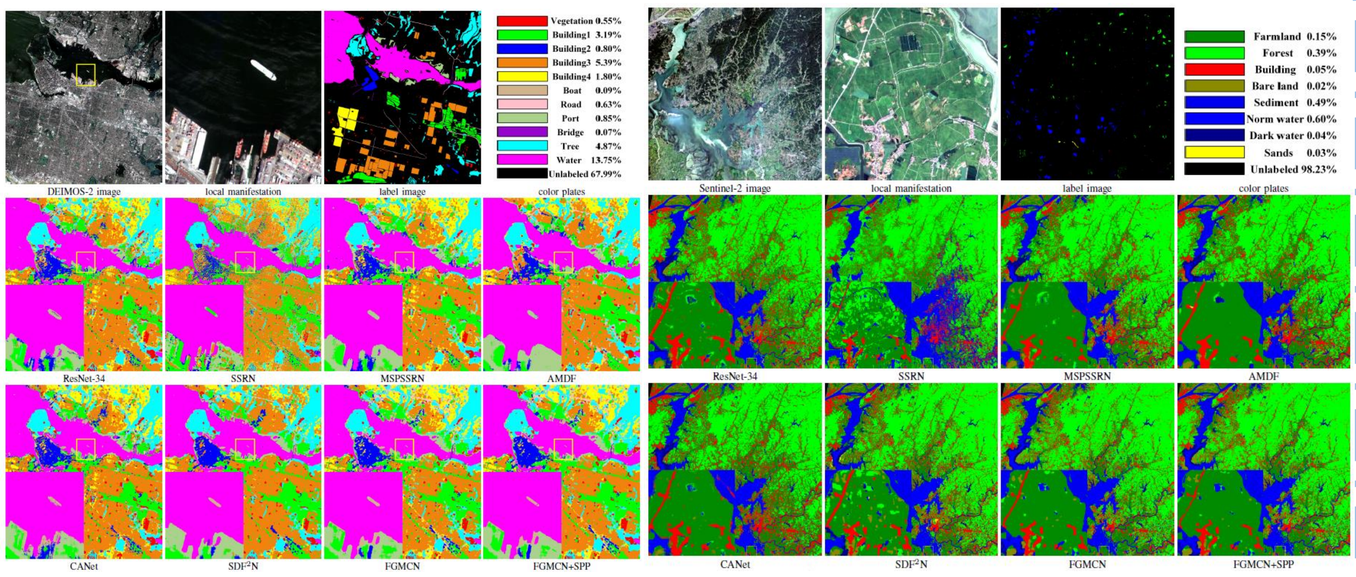
RESULTS

Hydrological patterns of Poyang Lake in recent years





Better classification → **More accurate estimation**



Land Use Classification of High-Resolution Multispectral Satellite Images with Fine-grained Multiscale Networks and Superpixel Post Processing

Year	Yearbook Planting Area (km²)	Extracted Cultivated Area (km²)	Yearbook Yield (tons)	Estimated Yield (tons)	Error Rate (%)
2014	30	31.6	77,318	75,115	2.85
2015	28.96	28.22	73,574	74,674	1.5
2017	27.13	27.81	67,852	71,460	5.32
2018	18.74	18.21	45,531	44,499	2.23
2019	21.23	20.08	51,390	49,770	3.14

Remote Prediction of Oilseed Rape Yield via Gaofen-1 Images and a Crop Model

DISCUSSION

Future work

1.Testing the classification algorithm for land cover changes during drought at Poyang Lake.

2.Evaluating the loss of oilseed rape yield in the case of flood and drought disaster in Poyang Lake.

CONCLUSIONS

1.The water level of Poyang Lake has been in a low state after the extreme drought disaster. Meanwhile, the water level and water area of Poyang Lake show a strong correlation.We can use this to assist in disaster warning.

2. Comparative experiments show that our method has good classification accuracy for high-resolution multispectral images.

MAJOR REFERENCES

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Publications

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