Insights into Spatiotemporal Variations of Net Primary Productivity of Terrestrial Vegetation in Africa During 1981-2018

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Introduction

Net primary productivity is not only an important variable to characterize plant activity and has practical significance in crop yield estimation, forest stock volume survey, grassland yield and ecosystem material circulation, but also the main factor to determine the carbon source and sink of the ecosystem and regulate the ecological process. Africa has the lowest greenhouse gas emissions of all continents (except Antarctica), but the worst effects of climate change on the stability of African ecosystems come first. Given that NPP is one of the key indicators to characterize the health of ecosystems, it is crucial to analyze the temporal and spatial variation trends of African vegetation NPP, which is of practical significance for ecological protection in Africa.

Objective

Using the long time-series data of global NPP from 1981 to 2018, this study will solve the following problems: (1) using trend analysis and coefficient of variation to analyze the change trend of African NPP; (2) using anomaly index analysis and Mann-Kendall test to study African NPP; (3) using wavelet analysis to explore the periodic variation and temporal patterns of African NPP.

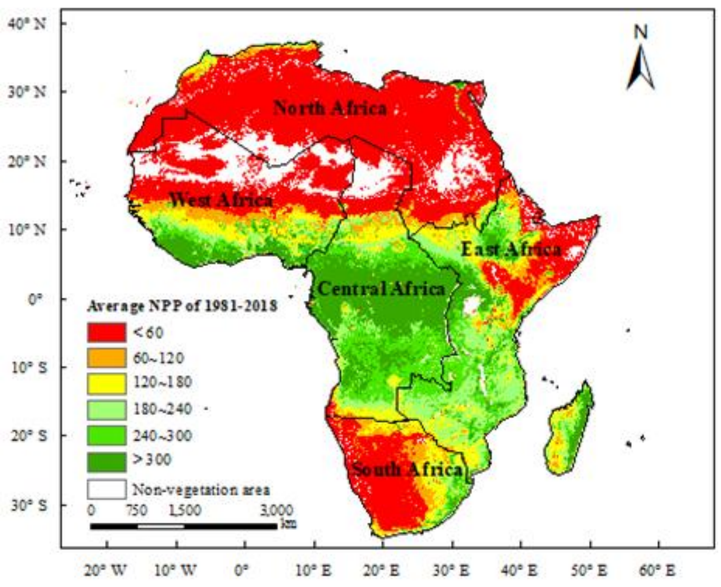

Figure 1 Study area

Methods

- Trend Analysis
- Coefficient of Variation
- Anomaly NPP
- Mann-Kendall mutation test
- Wavelet Analysis

Results

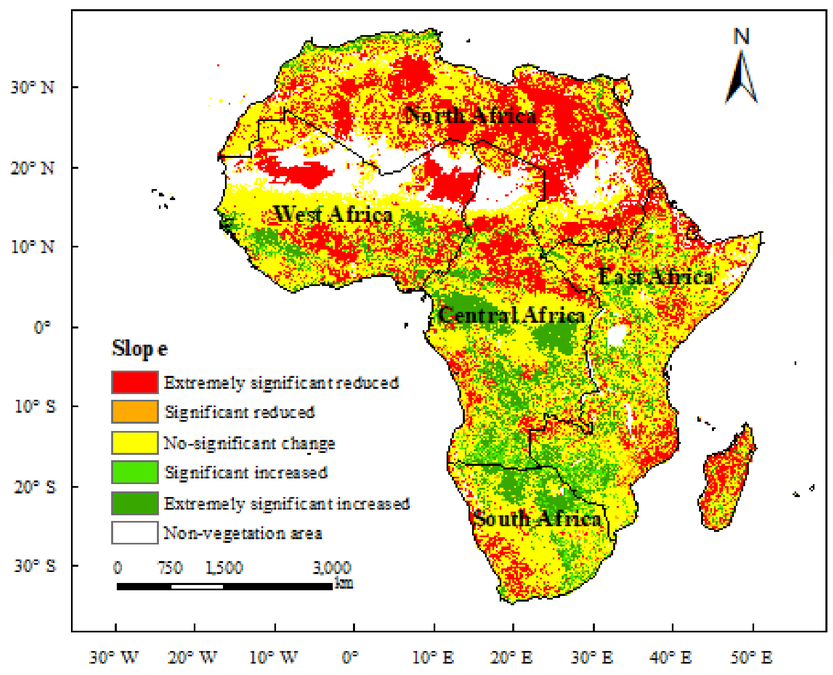

Figure 2 Slope trend

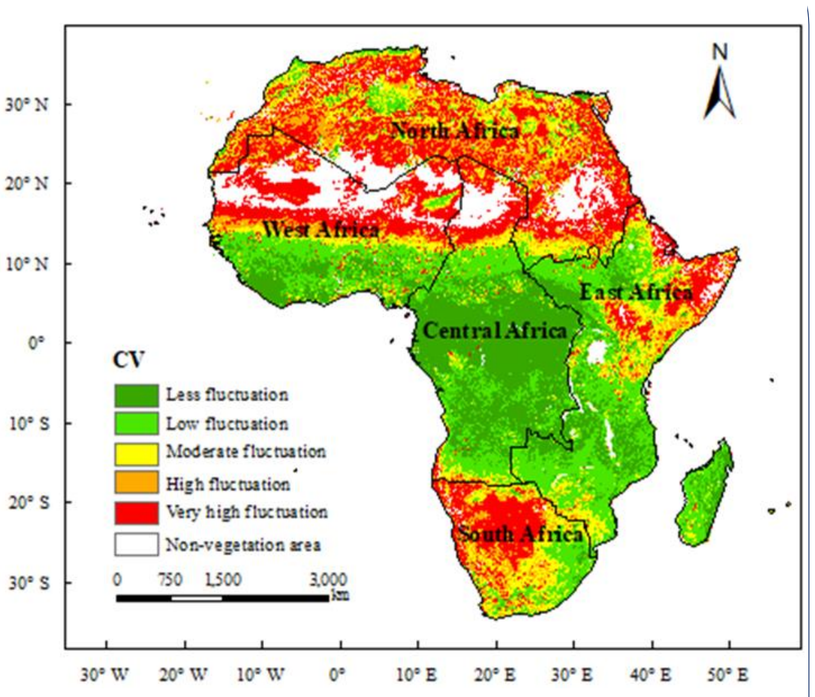

Figure 3 Fluctuation degree

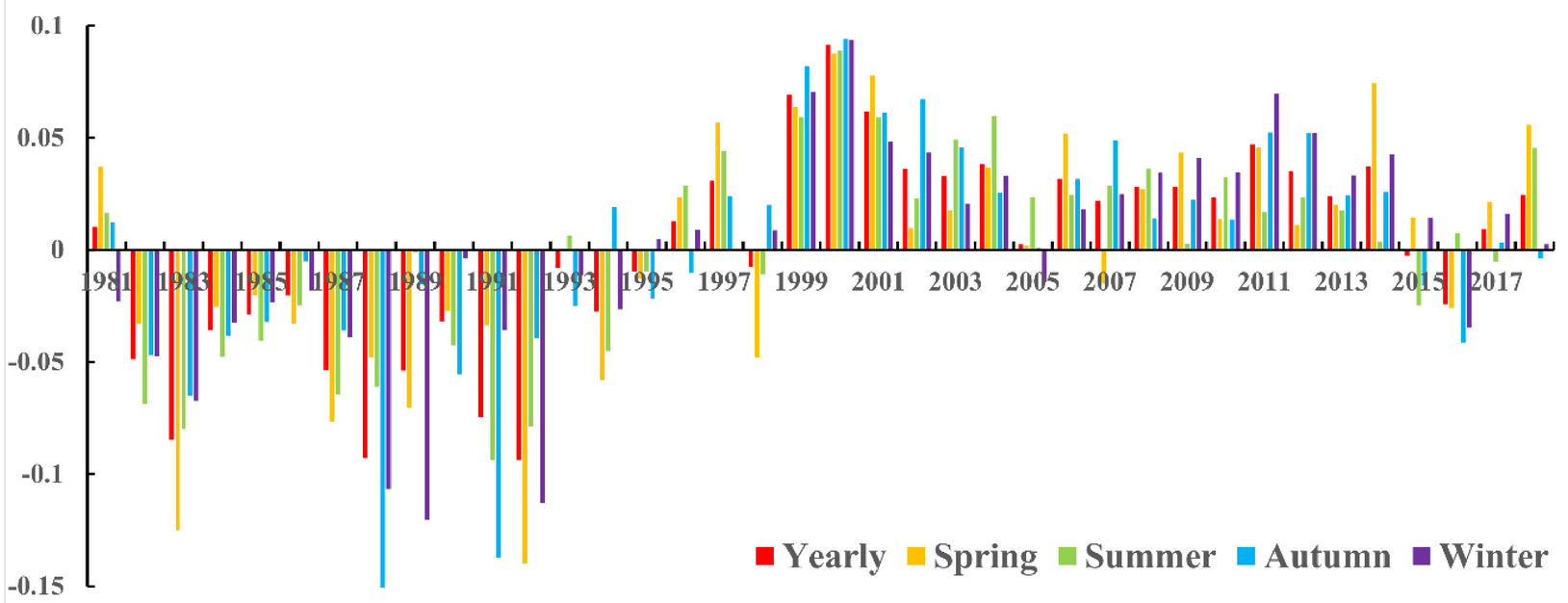

Figure 4 Interannual changes in anomaly NPP during different seasons

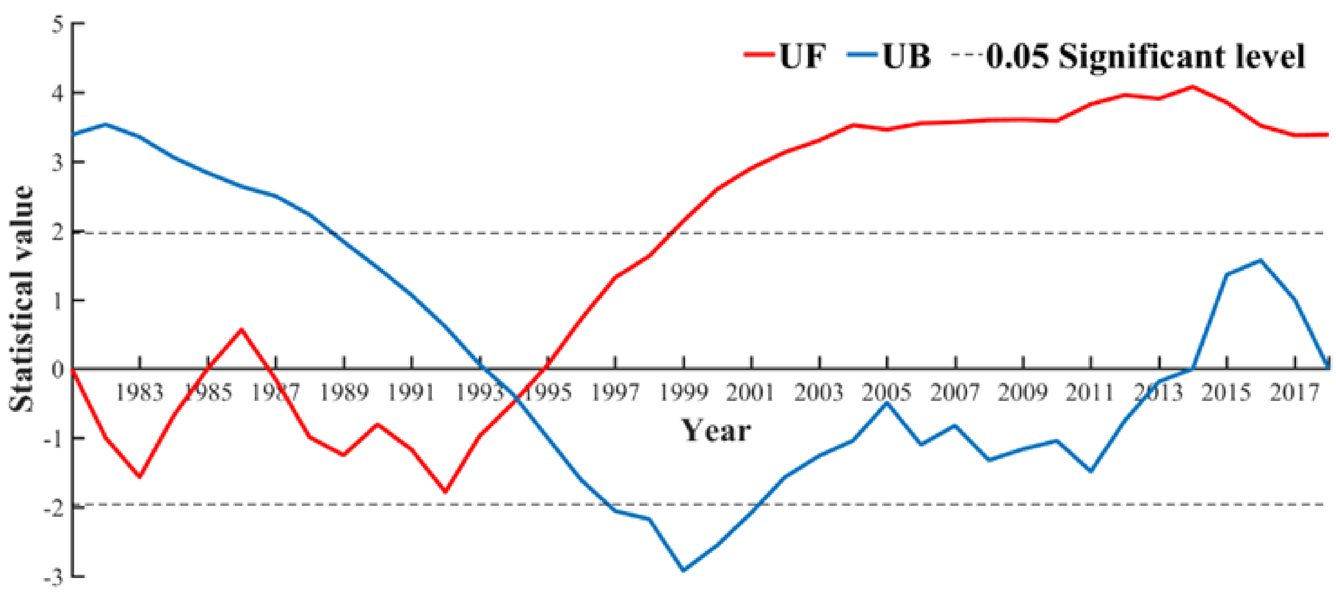

Figure 5 Mann–Kendall mutation analysis

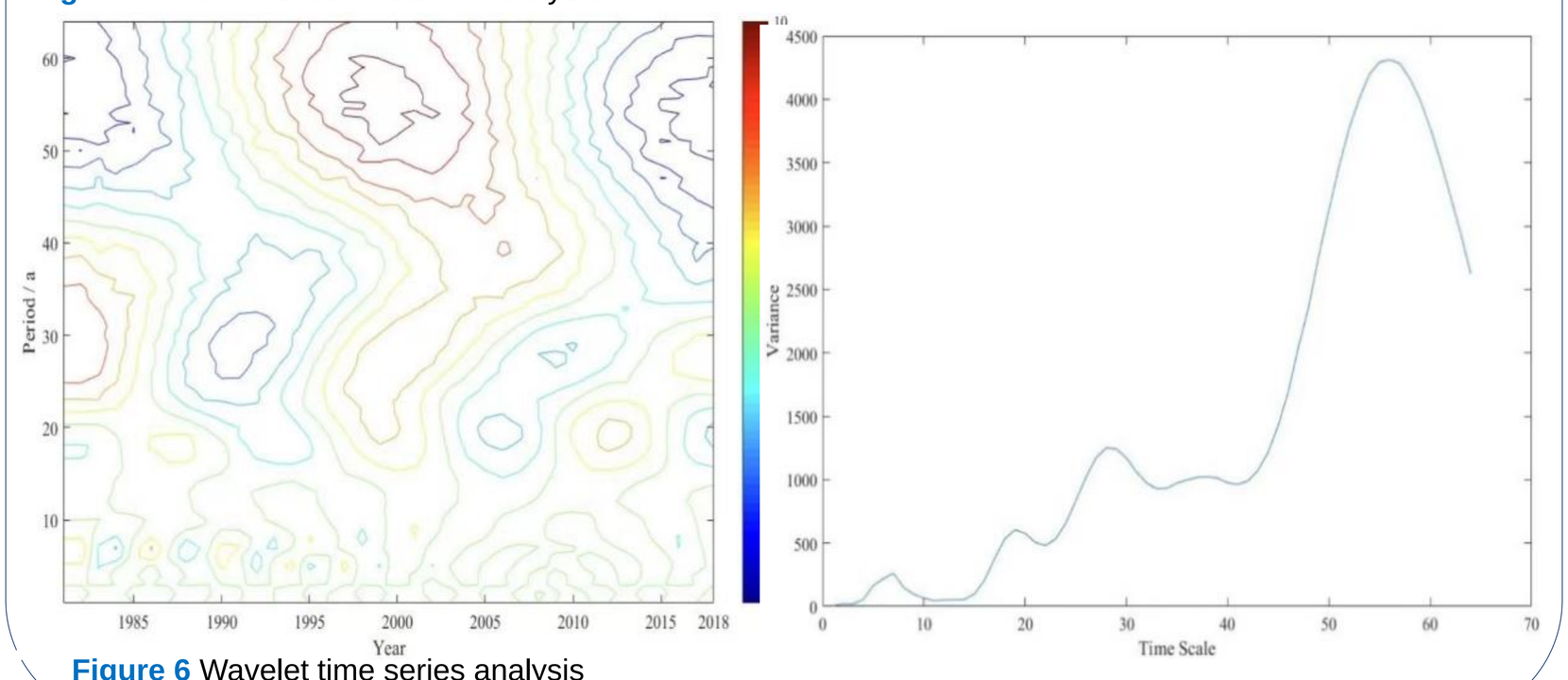

Figure 6 Wavelet time series analysis

Conclusion and Discussion

- Tropical rain forests showed an extremely significant increased trend and showed less fluctuation.
- The annual and four-season changes reached a significant level, and the mutation point were located in 1994, 1995, 1992, 1993 and 1994 .
- Short periods of 4-8 years, 15-21 years and 23-35 years and long periods of 42-62 years are obvious.