

(ID 197)

Seasonal Spatiotemporal Changes in the NDVI and its Driving Forces in Wuliangsu Lake Basin, Northern China from 1990 to 2020

Caixia Li.^{1,2}, Xiang Jia.^{1,2}, Ruoning Zhu.³, Xiaoli Mei.³, Dong Wang.³, Xiaoli Zhang.^{1,2*}

*¹Precision Forestry Key Laboratory of Beijing, College of Forestry,
Beijing Forestry University, China*

*²The Key Laboratory for Silviculture and Conservation of Ministry of Education,
Beijing Forestry University, China*

³The Third Construction Co., Ltd. of China Construction Group, China

**zhangxl@bjfu.edu.cn*

Abstract

In the context of global climate change, many studies have focused on the inter-annual vegetation variation trends and their response to precipitation and temperature, but ignored the effects of seasonal variability. This study explored the relationship between normalized difference vegetation index (NDVI) and seasonal climate elements in the Wuliangsu Lake Basin area from 1990 to 2020 and quantified the impacts of human activities on vegetation dynamics. We used Landsat series data to analyse the spatial and temporal variation of the NDVI using the trend analysis method, the Theil–Sen median, the Mann–Kendall test, and the Hurst index. Then, we used meteorological data and land use data to quantify the effects of human activities using residual analysis, and correlation methods to determine the driving forces of NDVI variations. The results showed that the NDVI changes presented obvious regional characteristics, with a decreasing trend from southeast to northwest in Wuliangsu Lake Basin. Due to global warming, the start of the growing season (SOS) is 4.3 days (2001 to 2010) and 6.8 days (2011 to 2020) earlier compared with 1990 to 2000. The end of the season (EOS) is advanced by 3.6 days (2001 to 2010) and delayed by 8.9 days (2011 to 2020). Seasonal (spring, summer, autumn, and winter) NDVIs with precipitation and temperature show spatial heterogeneity. Further, changes in grasslands and woodlands were vulnerable to climate change and human activities. Since the beginning of the 21st century, human activity was the driving force for vegetation improvement in the Dengkou, west-central, north and southwest regions, where ecological instability is weak. This finding can provide a theoretical basis for the implementation of the same type of ecological restoration projects and the construction of ecological civilization, and contribute to the regional green and sustainable development.

Keywords: Climate change, Driving forces, Human activities, Seasonal spatiotemporal changes, Wuliangsu Lake Basin