

The spatiotemporal evolution of net primary productivity, and its influencing factors in the Yellow River Basin

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Abstract

Ecosystem vulnerability in the Yellow River Basin (YRB) is a prominent concern. An in-depth exploration of net primary productivity (NPP) serves as an important aspect of assessing and protecting ecosystem health. We explored spatiotemporal changes and influencing factors of NPP in the YRB from 2000–2015, using a range of spatial analysis techniques, and cutting-edge computing-intensive variable importance decomposition methods. We found that NPP showed a fluctuating growth trend over time, ranging from 181.0–259.1 gC[?]m⁻²[?]a⁻¹, as well as a clear negative south-north spatial gradient. Significant spatial clustering patterns were observed, with Low-Low and High-High clusters being the dominant area classifications at grid cell, county, and city scales in the study area. We also found that NPP was statistically significantly affected by both natural factors (including climate and topography), and human activities, whilst meteorological factors were the most important factor and explained, on average, roughly 66% of the variability in NPP. Although the impact of human activities on NPP was relatively low when compared to natural factors, the former tended to increase with time and accounted for roughly 30% of the total variability explained by the model in 2015. Overall, this study provides an improved technical framework for undertaking a comprehensive analysis of the spatiotemporal pattern of NPP and its influencing factors at multiple-spatial scales.

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