Classification of Rangeland bioclimatic areas of Iran based on spectral analysis

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Abstract

This study was conducted to presenting rangeland bioclimatic zoning for Iran based on the changes in the power spectrum of the average monthly Net Primary Production (NPP) of the rangelands of Iran. Fluctuations of the average monthly power spectrum of the NPP signal of rangelands of Iran from 2000 to 2022 were analyzed using the Power Spectrum Density (PSD) method in the frequency band between 0-100 Hz. In 24 bioclimatic subzones, there are 4 common periods in all sites at frequencies of 0 (no change is repeated), 8.34 (3.59 days), 16.66 (1.80 days), and 25 (1.2 days) Hz observed, which shows that the major data changes occur in those periods and that the NPP changes of Iranian rangeland are more influenced by global and regional effects than local effects. The maximum power of these spectra is concentrated in high time scales; Therefore, cycles with lower frequency (higher time scale) are more important cycles than cycles with higher frequency (shorter time scale) and show that the changes of NPP in Iranian rangelands have long duration cycles under climate fluctuations. In the present research, using the results of the monthly mean power spectrum of the rangelands' NPP signal the Wards clustering method, and the Euclidean square distance, Iran was classified into 5+1 rangeland bioclimatic zones. It seems that this method provides a good match between biological boundaries and climate. Pearson's correlation coefficient was used to investigate the coherence of rangeland bioclimatic regions within each homogeneous group. Correlation results showed a significant spectral density similarity within groups at the significance level of 0.01% between rangeland bioclimatic regions, especially in the second and fifth clusters.

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