

Spatial and temporal variability in net primary production (NPP) of alpine grassland on Tibetan Plateau from 1982 to 2009

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Based on the NOAA AVHRR NDVI data (8 km spatial resolution) of 1982-2000, SPOT VGT data (1 km spatial resolution) of 1998-2009 and observation data, the CASA model is applied to analyze spatial-temporal characteristics of alpine grassland NPP change on Tibetan Plateau (TP). This study will help to evaluate health status of the alpine grassland ecosystem function, and will be also an important significance to sustainable development of pasture in the plateau, even working of the national ecological security shelter function on Tibetan Plateau. Spatial statistical analysis is carried out in accordance with physico-geographical zonality (natural zone, altitude, latitude and longitude), river basin, and administrative area in county. Data processing is completed on ENVI 4.8 platform while spatial analysis and mapping are completed on ArcGIS 9.3 and ANUSPLINE platform. The results show that: (1) The alpine grassland NPP gradually decreased from southeast to northwest on the TP, which is accorded with the gradients of precipitation and temperature. The average annual total NPP in alpine grassland on the TP is 177.2×10^{12} gC yr⁻¹, and the average annual NPP is 120.8 gC·m⁻² yr⁻¹ from 1982 to 2009. (2) The annual alpine grassland NPP on the TP has a fluctuating and uprising tendency ranging from 114.7 gC·m⁻² yr⁻¹ in 1982 to 129.9 gC·m⁻² yr⁻¹ in 2009, with an increase of 13.3%; the alpine grassland showing a significantly increased tendency of NPP is above 32% of the total's, while the alpine grassland showing a remarkably decreased tendency in NPP accounts for about 5.55% (3) There exist a notable spatio-temporal characteristics in tendency of annual NPP in alpine grassland: (a) NPP increased in the most natural zones on the TP, and a slightly decreased trend only in Ngari montane desert-steppe and desert zone is observed, where the increasing tendency of NPP in high-cold shrub-meadow zone, high-cold meadow steppe zone and high-cold steppe zone are significant than that in the high-cold desert zone; (b) As altitude rises, the percentage of area with increasing trend in annual NPP, has a trend of "increasing-steady-decreasing", while that with decreasing trend in annual NPP, has a trend of "decreasing-steady-increasing"; (c) The variations of annual NPP in latitude and longitude dimensions have an close relationship with the vegetation distribution; (d) The annual NPP variations in the main basins present growth tendency, in which the increasing trend in Yellow River basin is the most remarkable. Based on the change of the NPP, vegetation coverage and phenological phenomenon, the results show that even though few places getting worse, but the overall health condition of the alpine grassland is getting better on the TP.

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