Climate Change and Human Activity Impacts on the Net Primary Production of Alpine Grassland in Northern Tibet, China

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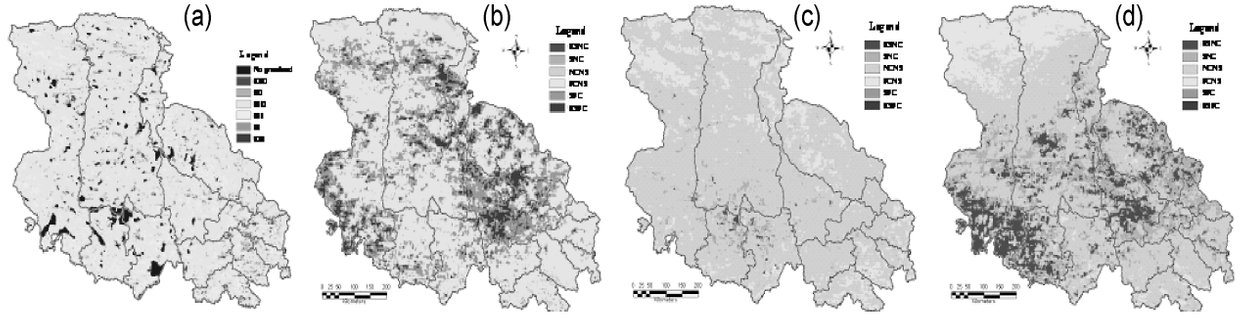
Key words : NPP , climate change , human activity , trends analysis , impact assessment , alpine grassland , northern Tibet

Introduction Northern Tibet region is the headstreams of major rivers , including Yangtze River , Nujiang River , and Lancangjiang River in China (Gao et al , 2005) . Based on the remote sensing data from 1981 to 2004 as well as other related data , spatial trend of alpine grassland net primary production (NPP) and its resonances to climate change and human activity in Northern Tibet were analyzed with the help of geographical information system .

Material and methods Alpine grassland NPP were calculated by the CASA (Carnegie-Ames-Stanford Approach) model and validated by comparing with observational data . Pearson coefficient was used to predict the long term variations of alpine grassland NPP from 1981 to 2004 . A correlative analysis was made to calculate spatial correlation coefficients between alpine grassland NPP and climate change in Northern Tibet . The impacts of human activity intensity was analyzed on alpine grassland NPP based on GIS techniques .

Results The change in alpine grassland in most areas of Northern Tibet was not obvious across roughly 89% of total grassland area ; while the area with marked change only accounts for 11 .4% , with roughly 11 .3% showing decrease and < 0 .1% increase (Figure 1) . In recent years , the precipitation variation in Northern Tibet resulted in an increase of grassland NPP , though solar radiation resulted in decreased grassland NPP . During the period of 1981-2004 , climate factors affected the grassland NPP in Northern Tibet in the following orders : total solar radiation > precipitation > temperature (Figure 1) . The negative effects of local residential areas on the rate of grassland NPP change are smaller than that of roads . In general the intensity of human activity in the region near to road and the residential area are strong and the influence on grassland NPP change tendency are bigger .



(a) Trends of NPP ; (b) NPP and precipitation ; (c) NPP and temperature ; (d) NPP and solar radiation ESD is extremely significant decrease ; SD is significant decrease ; ISD is insignificant decrease ; ISI is insignificant increase ; SI is significant increase ; ESI is extremely significant increase ; ESNC is extremely significant negative correlation ; SNC is significant negative correlation ; NCNS is negative correlation but none significant ; PCNS is positive correlation but none significant ; SPC is significant positive correlation ; ESPC is extremely significant positive correlation

Figure 1 *Trends of grassland NPP and spatial correlation between alpine grassland NPP and annual precipitation , annual mean temperature and annual solar radiation in Northern Tibet .*

Conclusions Most areas in Northern Tibet did not show a significant annual NPP change . The negative effects of local residential areas on the rate of grassland NPP change are smaller than that of roads . During the period of 1981-2004 , climate factors affected the grassland NPP in the following orders : total solar radiation > precipitation > temperature . Generally , the impact of regional climate change on grassland NPP was more negative than positive .

References

Gao Qingzhu , Li Yue , Lin Erda , .2005 . Temporal and spatial distribution of grassland degradation in Northern Tibet , Acta Geographica Sinica , 60(6) :965-973 .

Nemani R .R , Keeling C .D , Hashimoto H . 2003 . Climate-driven increases in global terrestrial net primary production from 1982 to 1999 . *Science* , 300 :1560-1563 .