AN ANALYSIS OF TEMPORAL EVOLUTION OF NDVI IN VARIOUS VEGETATION-CLIMATE REGIONS IN INNER MONGOLIA, CHINA

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1. Introduction

As the main part in terrestrial ecosystems, vegetation is the result of long-term effect by variety natural factors of a region. In the same climatic regions, the heterogeneity of natural conditions is small and the vegetation also has certain homogeneity. These provide us a appropriate selection to analyze the vegetation change according to unique phonological characteristics of different regions[1].

Based on the above understanding, this study analyzed vegetation variation in different vegetation-climate regions with Mann - Kendall non-parametric test. The detail of the method can be seen from the relevant articles [2-4] . Study data were the Chinese climatic regions data (Figure 1) [5] and long temporal series NOAA-AVHRR NDVI sets [6, 7] from 1982 to 2006 with time resolution of 15 days and spatial resolution of 8km in Inner Mongolia Autonomous Region, China.

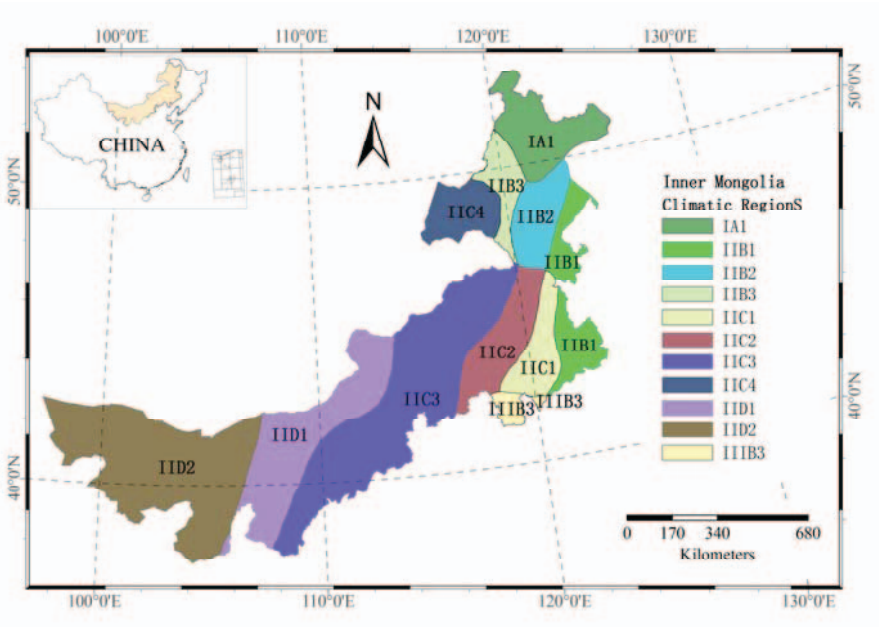

Figure 1 The 11 Vegetation-Climate Regions in Inner Mongolia

2. Results and Analysis

2.1 The NDVI change in different vegetation-climate regions

NDVI mean value reflects the local natural environmental conditions over the years (Table 1), while its range reflects the fluctuation of vegetation over the years. The various vegetation-climate regions were in the following order: IA1, its value range: [0.7,0.9]; IIB2, range: [0.75,0.9]; IIB3, range: [0.65,0.85]; IIC2, range: [0.45,0.7] ; IIIB3, range: [0.4,0.7]; IIB1, range: [0.4,0.65]; IIC4, range: [0.35,0.65]; IIC1, range: [0.35,0.55]; IIC3, range: [0.3,0.5] ; IID1, range: [0.15,0.25]; IID2, range: [0.07,0.11] (Figure 2).

Tables 1 The Vegetation-Climate Regions in Inner Mongolia

Encodes	Climate zones	Mean (NDVI)	Eco-geographical regions
IA1	Humid region, Cold temperate zone	0.83	Morth Daxinganling mountain deciduous coniferous forest region
IIB1	Semi-humid region, Medium temjperate zone	0.55	Middle Songhuajiang and Liaohe Rivers plain forest-steppe region
IIB2	Semi-humid region, Medium temjperate zone	0.82	Middle Daxinganling mountain steppe-forest region
IIB3	Semi-humid region, Medium temjperate zone	0.76	Hill land of north part of west Daxinganling piedmont forest-steppe region
IIC1	Semi-arid region, Medium temjperate zone	0.46	West Liaohe River plain steppe region
IIC2	Semi-arid region, Medium temjperate zone	0.60	South Daxinganling steppe region
IIC3	Semi-arid region, Medium temjperate zone	0.39	East Inner Mongolia mid-altitude plain steppe region
IIC4	Semi-arid region, Medium temjperate zone	0.50	Hulun Buir plain steppe region
IID1	Arid region, Medium temjperate zone	0.19	Hetao and west Inner Mongolia mid-altitude plain desert steppe region
IID2	Arid region, Medium temjperate zone	0.09	Alax and Hexi Corridor shrub and semi-shrub desert region
IIIB3	Semi-humid region, Warm temperate zone	0.59	North China mountain deciduous broadleaved forest region

Source: Zheng Du et al.[5]

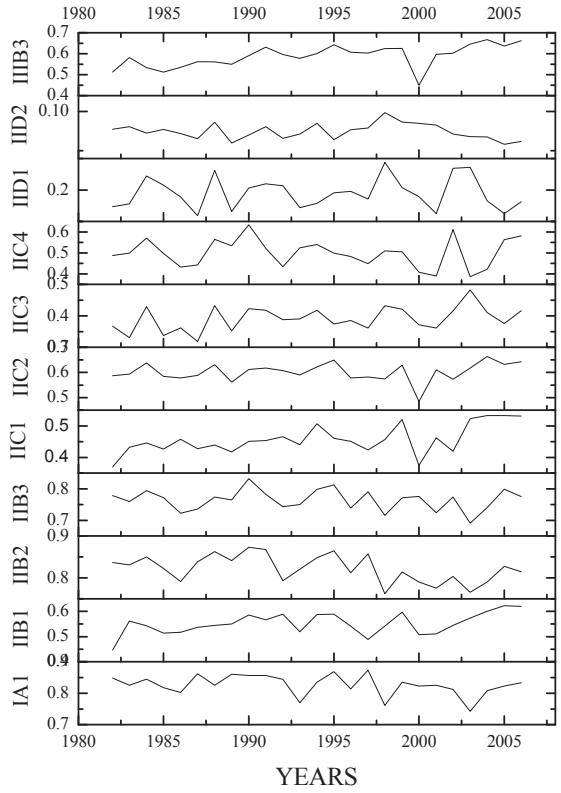

Figure 2 NDVI change in different vegetation-climate regions

2.2 Vegetation trends and mutation testing

Table.2 Mann-Kendall test for the 11 vegetation-climate regions

Encodes	S Values	Z Values	P Values	Tread	Confidence	Mutational years
IA1	-72	-1.661	0.0967	Descend	95%	1992
IIB1	104	2.407	0.0161	Ascend	99%	---
IIB2	-89	-2.056	0.0398	Descend	95%	1995
IIB3	-17	-0.374	0.7086	Descend	< 90%	1997
IIC1	132	3.061	0.0022	Ascend	99%	---
IIC2	41	0.935	0.3498	Ascend	< 90%	2002
IIC3	54	1.238	0.2155	Ascend	< 90%	1990
IIC4	-27	-0.607	0.5436	Descend	< 90%	1996
IID1	1	0	1	--	--	---
IID2	-36	-0.821	0.4115	Descend	< 90%	2001
IIIB3	180	4.181	0	Ascend	99%	---

NDVI showed degradation trend in IA1, IIB2, IIB3, IIC4, IID2 regions. That is, some partial areas of Daxinganling forest, Hulunbeier grassland areas, Alashan and Hexi Corridor had a descend trend, while the Central and Western part of Inner Mongolia had an ascending trend.

IIB1, IIC1, IIC2, IIC3, IIIB3 showed the ascend trend. This meant, the NDVI improved region mainly

distributed at the mid-eastern part of Inner Mongolia during the study period.

IID1, namely Hetao and western parts of Inner Mongolia desert steppe region, its NDVI had little change.

3. Conclusion

The study showed that: 1) Inner Mongolia was divided into 11 Vegetation-climate Regions. The NDVI values and ranges had a big difference in the respective regions, indicating that spatial distribution of vegetation was obvious difference. 2) The inter-annual changes of NDVI are different in different vegetation-climate regions. Some partial areas of Daxinganling forest, Hulunbeier grassland areas, Alashan and Hexi Corridor had a descend trend, while the Central and Western part of Inner Mongolia had an ascending trend.

In the study area, some researchers analyzed the ecological changes with the different method [8, 9], comparing to the previous studies, our conclusions are basically consistent with them.

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