Research on Vegetation Ecologic Quality Index of Rocky Desertification in Karst Area of Guangxi Province Based on NPP and Fractional Vegetation Cover Since 2000

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Research on vegetation ecologic quality index of rocky desertification in Karst area of Guangxi Province based on NPP and fractional vegetation cover since 2000

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Abstract. Karst rocky desertification is a kind of special and complicated surface form. Study established the Net primary productivity (NPP) estimation model based on the use of solar energy utilization of remote sensing data model in rocky desertification region of Guangxi province and the fractional vegetation cover(VFC) is obtained by the method of sub-pixel decomposition model. The comprehensive analysis method was used to establish vegetation ecologic quality index by using NPP and fractional vegetation cover to monitor the Rocky Desertification in the study area from 2000 to 2016, and mapping vegetation ecologic quality index grade classification. Results show that:1) In 2016, vegetation ecologic quality index in rocky desertification region of Guangxi province is 87.6, the highest since 2000.Hechi city is the best in Guangxi Province. 2)From 2000 to 2016, vegetation ecologic quality index annual growth has a 1.04, the highest is 87.6(in 2016) and the lowest is 63(in 2004). The ecological restorations and environmental control projects have achieved remarkable results. 3)Great grade、 Good grade and normal grade areas can account for 94.5%. And vegetation ecologic quality index decreased obviously in some relative development regions, such as Guilin city and Hezhou city.

Keywords: Karst rocky desertification. vegetation ecologic quality index. NPP. fractional vegetation cover.

1 Introduction

Karst rocky desertification is a kind of special and complicated surface form, which is performance for the fragile ecological environment, and lead to the deterioration of regional ecological environment, so that drop the effective use of land resources, water resources have been destroyed, the survival of the foundation of the loss of biological resources. As an important index, NPP can reflect the changes of ecological environment; determine the ecosystem carbon source/sink effect. NPP is a key indicator of the terrestrial carbon cycle. The different ecological models have been obtained by many ecologists or researchers such as Coughlan 1988, Running and Nemani et al. 1993, ZhiQiang & JiYuan 2008, BGC models. Currently, three BGC models are used. There are BIOME-BGC model, Terrestrial Ecosystem Model (TEM) and CENTURY model. Fractional vegetation cover is a key and land degradation. It is a very important parameter in developing climate and ecology model.

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NPP and VFC are very important parameters in developing climate and ecology model. Study established the NPP estimation model based on the use of solar energy utilization of remote sensing data model in rocky desertification region of Guangxi

province and the VFC is obtained by the method of sub-pixel decomposition model. The comprehensive analysis method was used to establish vegetation ecologic quality index by using NPP and VFC to monitor the Rocky Desertification in the study area, and mapping vegetation ecologic quality index grade classification.

2   Study Area and Data Used

2.1   Study Area

Study Karst rocky area is located in Guangxi Province between 104°26, E to 112°04' E and 20°54' N to 26°24' N. The study zones are blue areas.
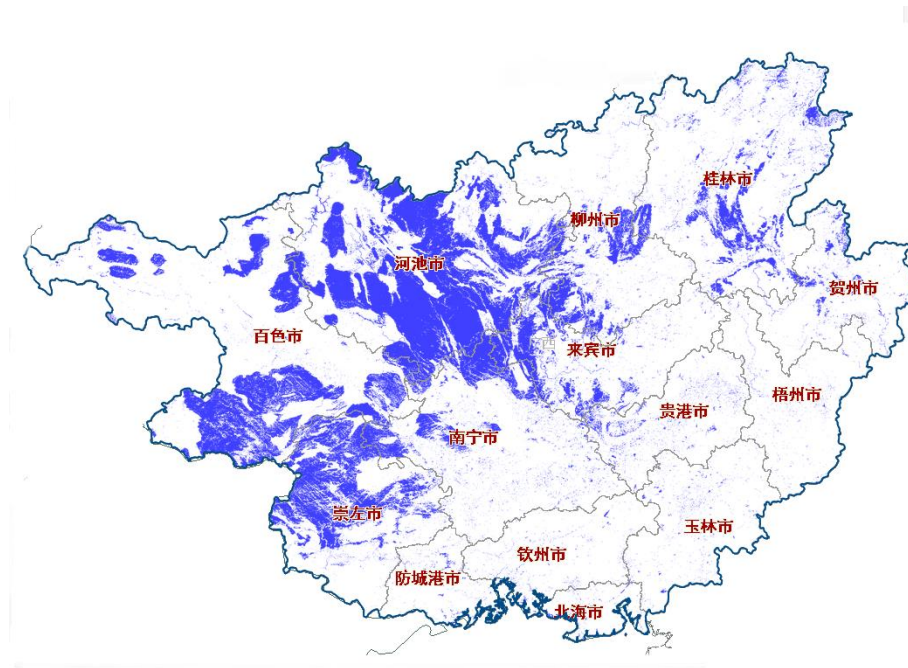

Fig. 1. Karst rocky areas of Guangxi Province

2.2   Data List

Table 1. Data list of Study.

Meteorological Data	Remote sensing data	Environmental background data
Mean temperature	NDVI	Vegetation types
Sunshine duration	LST	Administrative divisions
Water-vapor pressure		
Dew-point temperature		

3 Methodology

NPP and VFC are very important parameters in developing climate and ecology model. The comprehensive analysis method was used to establish vegetation ecologic quality index by using NPP and fractional vegetation cover.

3.1 NPP Calculate

Our study was obtained by using seventeen−years historical data of NPP from NSMC (National Satellite Meteorological Centre) which obtained by using GloPEM model and extracted by using NOAA-AVHRR and MODIS data (2000-2016).

3.2 Fractional Vegetation Cover Calculate

Currently, field measurement method and remote sensing monitoring method are two methods of getting fractional vegetation cover. Field measurement method plays an important role in measure of fractional vegetation cover, which routinely widely used because of its high precision. However, this method is limited by bad weather, time and measure area condition. The method is also very expensive. With the development of remote sensing technique, remote sensing monitoring method in monitoring of fractional vegetation cover was provided. It possible to obtain fractional vegetation cover and its dynamic change in a large area, because remote sensing has the characteristics of periodic detection and large scale. The method has been widely used. In our study, pixel unmixing model was used to extract fractional vegetation cover because of its practical feature and simple. The VFC was modelled as:

$$VFC = (NDVI - NDVIsoil)/ (NDVIveg - NDVIsoil) \tag{1}$$

in which:

$$NDVIsoil=(VFCmax*NDVImin- VFCmin*NDVImax)/(VFCmax- VFCmin)$$

$$NDVIveg=((1-VFCmin)*NDVImax- (1-VFCmax)*NDVImin)/(VFCmax- VFCmin)$$

3.3 Vegetation Ecologic Quality Index Calculate

The vegetation ecologic quality index(VEQI) was generated by using 17-years records of annual NPP and VFC values of rocky desertification in Karst area of Guangxi Province. The pixel level estimated trend analysis was generated by using geostatistical method. The vegetation ecologic quality index trend of annual NPP was modelled as.
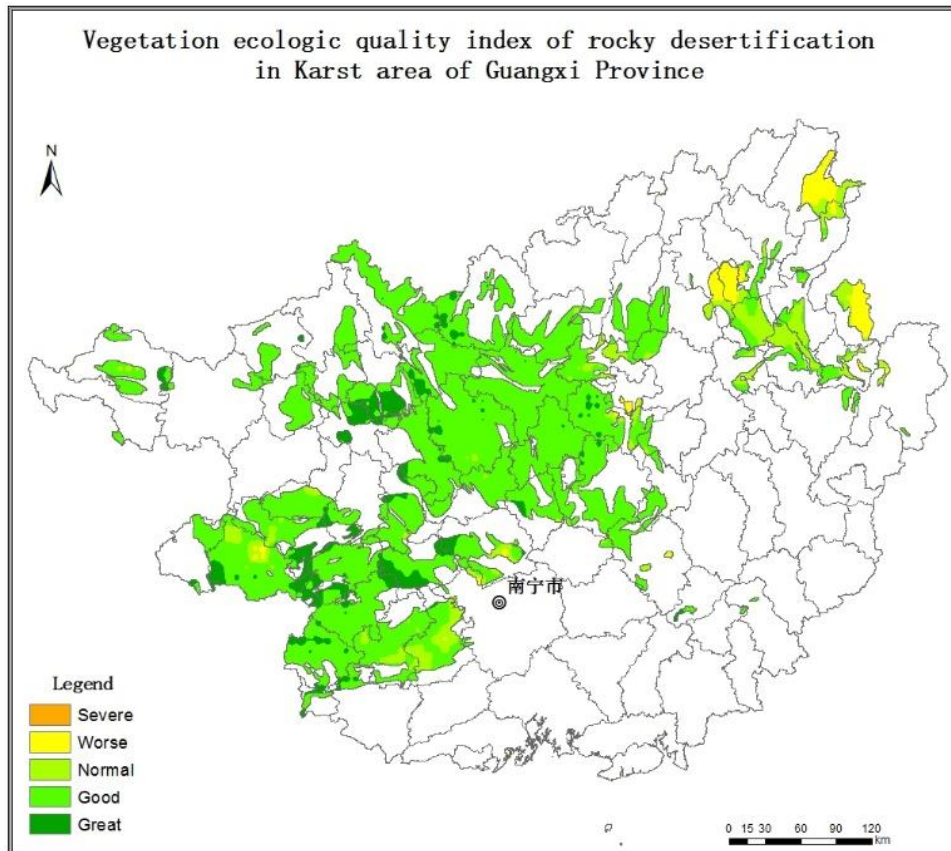
$$VEQI= NPP\ t +VFCt \tag{2}$$

Fig. 2. Vegetation ecologic quality index of rocky desertification in Karst area in 2016

Fig. 3. Vegetation ecologic quality index of rocky desertification in Karst area of 14 cities in 2016
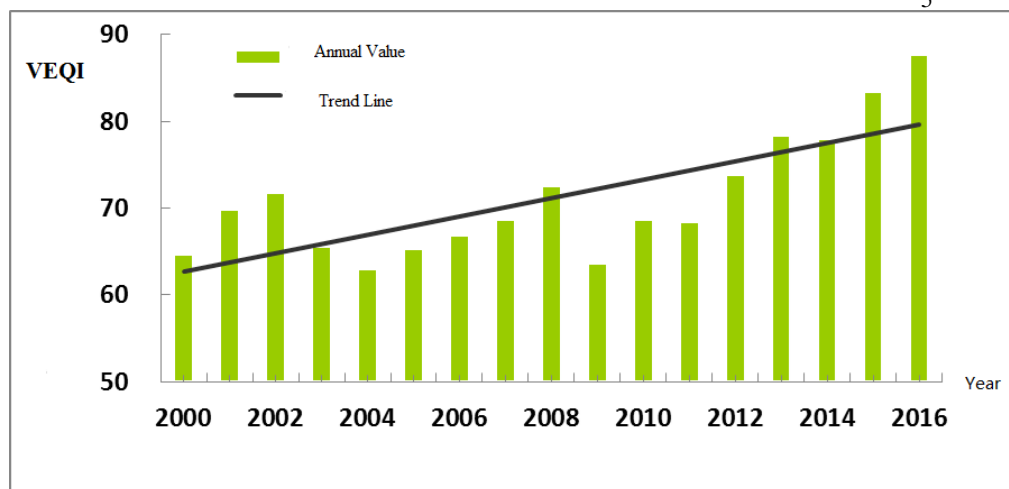
Fig. 4. Vegetation ecologic quality index of rocky desertification in Karst area from 2000 to 2016

4 Result and Discussion

By analyzing the Vegetation ecologic quality index (Fig. 2、 Fig. 3 and Fig. 4) of rocky desertification in Karst area of Guangxi Province.

1)In 2016, vegetation ecologic quality index in rocky desertification region of Guangxi province is 87.6, the highest since 2000.Hechi city is the best in Guangxi Province.

2)From 2000 to 2016, vegetation ecologic quality index annual growth has a 1.04, the highest is 87.6(in 2016) and the lowest is 63(in 2004). The ecological restorations and environmental control projects have achieved remarkable results.

3)Great grade、 Good grade and normal grade areas can account for 94.5%. And vegetation ecologic quality index decreased obviously in some relative development regions, such as Guilin city and Hezhou city.

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