A study on the relationship between dynamic change of vegetation coverage and precipitation in Beijing’s mountainous areas during the last 20 years

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Abstract

Beijing’s mountainous areas have an important ecological significance because they are ecological conservation and water source protection areas of Beijing. The impact of precipitation on the vegetation coverage of Beijing's mountainous areas is qualitatively analyzed using multi-temporal Landsat images obtained during the last 20 years. Firstly, the influence of external factors, such as phenology and relative radiometric correction, on the normalized difference vegetation index (NDVI) are removed by the normalization of remote sensing images for different periods. Then, the vegetation coverage is calculated using the method of the dimidiate pixel model. Finally, based on that, the relationship between precipitation in different seasons and change of vegetation coverage is discussed. The results indicate that the mean vegetation coverage has the same change trends with winter and summer precipitation, but an opposite change trend with spring precipitation. The paper provides a theoretical basis and data support for further research on driving models of natural vegetation restoration in Beijing’s mountainous areas.

1. Introduction

Beijing’s mountainous areas are ecological conservation and water source protection areas, as well as a center of biodiversity and a major natural vegetation distribution region. Ecological security and water resource supplies in Beijing are affected by vegetation coverage. It has an important reference significance for building driving force models of natural force recovery from consideration of the relationship between dynamic change of vegetation coverage and precipitation in Beijing’s mountainous areas.

The definition of vegetation coverage is the percentage of vegetation occupying the ground area in vertical projection [1]. It is the combined result of natural environment changes and human activities, and it is also an important parameter in many remote sensing ecological models. As a very useful Earth-observation tool, remote sensing technology has great temporal–spatial advantages [2]. It can reflect the temporal–spatial difference characteristics of vegetation coverage via analysis of multi-temporal remote sensing images [3]. The annual variation of vegetation coverage is caused by multiple influence factors such as different climates and human activities, among which climate change is the main factor [4]. At the same time, precipitation is one of the main climate factors. So, many experts and scholars have carried out comprehensive and in-depth research on the relationship between dynamic change of vegetation coverage and precipitation. Sun et al. selected the Yellow River Basin in China as the study area for assessing the inter-annual change of vegetation coverage, and

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