REMOTE SENSING MONITORING FOR VEGETATION CHANGE IN MINING AREA BASED ON SPOT-VGT NDVI

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ABSTRACT

Environment and vegetation cover in mining area are influenced by the exploitation and utilization of mineral resources. It needs dynamic monitoring and estimation by the help of satellite remote sensing technology. Taking SPOT-VGT NDVI as information source and considering the characteristics of mining areas in north China, this paper introduced how to monitor the vegetation change and desertification in mining area. The method includes the composition of time series data, the variation analysis on the vegetation and gradation of desertification land.

Concretely, to protrude the characteristics of vegetation change, the method of composition is different from the location of the mining area. For mining area in arid and semi-arid regions, the time series data should be composed by Maximum Value Composite (MVC). In semi-humid regions, the data should be composed using the cumulated NDVI images during vegetation growth seasons. In humid regions, the data could be composed using the mean NDVI images for the whole year.

Based on the yearly SPOT-VGT NDVI data, the linear regression of one variable was used to simulate the change trend of the vegetation in mining area. For each pixel, the slope of the fitted line showed the changing trend of the vegetation. For example, it means the good trend for the vegetation when the slope is positive. On the other hand, it means bad trend for the vegetation when the slope is negative. In detail, the variation degree of vegetation was divided into 7 levels according to the slope of the fitted line by use of NDVI time series.

Especially, for mining areas in arid and semi-arid regions, such as northwest China, land desertification is one of the main environmental problems. To monitor and estimate desertification in mining area, vegetation coverage is taken as an index. There are two means for computing vegetation coverage by the help of remote sensing data. One is computed according to the relationship of the remote sensing data and in-situ data, and the other is computed from NDVI data directly. For this paper, the second method was selected because the relationship of NDVI and vegetation coverage was known from other projects. Furthermore, the land desertification was divided into 5 levels according to the vegetation coverage.

The presented method was validated in Shendong mining area. It locates in northwest China, and has annual yield of more than 100 million tons raw coal. The SPOT-VGT NDVI data acquired from 1999 to 2007 was processed using MVC method. For the variation analysis based on NDVI, the result showed that improved vegetation area accounted for 80.78%, and the degraded vegetation area accounted for less than 1%. For the land desertification, the result showed that the serious land desertification ratio decreased to 31.68% in 2007 from 88.33% in 1999. Spatially, in the eastern and central part of the mining area, the land desertification improved obviously. There are two main reasons for the above changes. Firstly, in general, yearly precipitation was increasing during the past 9 years. Secondly, environmental control was active and effective, both from government and mining industry. For instance, Shendong Company would

pay 0.45 RMB Yuan for environmental protection for every ton of raw coal production. The results of this paper will be helpful to the decision-making process associated with environmental management and landscape planning activities.

KEY WORDS: environment in mining area；SPOT-VGT NDVI；vegetation coverage；dynamic monitoring；digital mine

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