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Pasture Vegetation Changes in Mongolia

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Abstract : The NDVI (normalized difference vegetation index) dataset is unique or main tool to assess the global, multi seasonal, multi annual, and multi spectral changes over the World. These features are useful for environmental studies in particular, for the vegetation coverage monitoring of the country as Mongolia, where are large pastureland and pastoral animal husbandry, which dependant on natural conditions. Pasture vegetation cover is changing accordingly with both of global climate change and anthropogenic effect or human impacts.

Using past 20 years (1982-2001) NDVI derived from NOAA satellite, its dynamical trend has been decreased in all natural zones differently. Also applied the method named "Two Years Differences" which could calculate the number of years with increased or decreased NDVI values at the same place. From May to September have occurred the 9 years maximum decreases of NDVI over Mongolia, but it obtained differently in spatial and temporal scale. In 24.4 ? 32.7% of all territory occurred one year decrease of NDVI and in 18% occurred more than 3 years frequent decrease of NDVI. According to the linear trend of NDVI dynamics over 69% of whole territory of Mongolia NDVI values had been decreased due to both natural and human induced impacts to the pasture condition.

In this paper also included some results of the integrated analyses of NOAA/NDVI and ground truth data over Mongolia separately by natural zones.

Key Words : pasture, vegetation cover, NDVI, dynamics, integration.

Data and Methods

The normalized difference vegetation index (NDVI) data is one of the indices, which could indicate green vegetation condition over the year and over the World.

The NDVI value could obtain from various satellite data differently, but actually we have used NDVI data derived from AVHRR data of NOAA satellite. The NOAA/NDVI data was selected because of its high frequency, wide coverage for one pass and long duration of data ranging. In this study used 10 days composite NOAA/NDVI 8 km resolution data from 1982 to 2001, provided from NOAA/NASA Pathfinder data set.

For Eastern Mongolia vegetation monitoring have been used SPOT/Vegetation satellite data from 1998 to 2002.

Using 20 years NDVI data have been applied the new method of "Two Years Difference", which is sum of differences between two consequence years' NDVI values.

$$cNDVI = \Sigma\{NDVI[i,j,(k-1)]-NDVI(i,j,k)\} \quad (1)$$

where, i, j, k - NDVI value of i row and j column in certain k year, k-1 - previous year.

This difference values separated in 2 groups as, negative values are increase or no change (coded as 0) and positive values are decrease (coded as 1), and the summarized values could show the number of years with NDVI decreasing.

With accordance of long term dynamics of pasture vegetation changes have been analyzed the coefficients of linear changes within 20 years of study.

Results

The time series analysis showed that, the vegetation condition was changes differently in each 10 days over the study area. For instance, during 20 years in each month from May to September occurred 9 years NDVI decreases over Mongolia in maximum. In 24.4 - 32.7% of all territory occurred one year decrease of NDVI and in 18% occurred more than 3 years frequent decrease of NDVI. In 69% of whole territory of Mongolia NDVI values had been decreased due to both natural and human induced impacts to the pasture condition.

Year of 2002 was occurred most drought year over Eastern Mongolia. The integrated assessment of the NDVI and pasture related thematic maps have achieved the results of estimating pasture degradation of the steppe zone, that its NDVI has decreases by 0.4-4.4 units a year and the biomass decreased in 37.5% or 3-4 ts/ha and also the NDVI decreased by 1.1-2.5 units due to overgrazing.

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