

Influence of interannual and seasonal variation of rainfall, air temperature and snow depth on NDVI over Mongolia

Hiroyuki Iwasaki[1]; Tomomi Nii[1]

[1] Faculty of Education, Gunma Univ

[1. Introduction] In the Mongolia located in the vegetation transition zone, interannual and seasonal variation of meteorological elements influences vegetation activity greatly. Miyazaki et al. (2004) pointed out that significant positive correlation were found for rainfall in July and LAI (leaf area index) in August, and significant negative correlation for air temperature in June and LAI in June at Arvaikheer of the central Mongolia. However, there is few studies on the relationship between vegetation activity and meteorological elements over the whole Mongolia. A purpose of this study is to describe on the influence of interannual and seasonal variation of rainfall, air temperature and snow depth on vegetation over Mongolia.

[2. Data] We used 10-day composite NOAA NDVI data provided by Center for Environmental Remote Sensing, Chiba University, and surface meteorological data provided by Institute of Meteorology and Hydology, Mongolia. Analysis period is from 1993 to 2000.

[3. Method]

1) At first, developing stage and mature stage of vegetation were defined for each meteorological station using seasonal variation of 8-year mean NDVI. Mature stage was define as the period the 10-day when NDVI became maximum and before and after 20 days of it, and it is almost corresponding to the end of July to the beginning of September. Developing stage was defined as the period before 50 days of mature stage, and it is almost June to July.

2) Vegetation activity in the developing stage and mature stage was defined as the sum of NDVI in the developing and mature stage, respectively.

3) 30-day mean rainfall, air temperature and snow depth were calculated for every 10-day.

4) Correlation coefficient between vegetation activities in two stages and three meteorological elements were calculated for all combination. In this study, correlation less than 99% confidence level ($-0.85 < R < 0.85$) were ignored.

[4. Results]

4.1 Relationship between NDVI and rainfall: Significant positive correlation between vegetation activity in developing stage and rainfall in June are recognized at 28% of all stations. Even if it is the grassland, there is a lot of stations exhibiting significant positive correlation in steppe than forest steppe.

On the other hand, number of station exhibiting significant positive correlation increase to 48% in mature stage. Rainfall before 1-2 months (June-July) of the mature stage had impacted on the vegetation activity in mature stage (August).

Significant correlation were recognized at 29 % of all station in forest steppe, at 40 % in steppe and at 67 % in desert steppe, respectively. The correlation coefficient with rainfall tends to be high at vegetation zone with a little annual rainfall.

4.2 Relationship between NDVI and air temperature: There are several stations exhibiting significant correlation in developing stage. However, any regularity could not be found.

On the other hand, significant negative correlation are recognized at 52% of all stations in mature stage. High temperature in mature stage had impacted on vegetation activity in mature stage. A ratio of stations exhibiting significant correlation is about 50% in forest steppe, steppe and desert steppe, respectively. There is no clear difference among grasslands.

4.3 Relationship between NDVI and snow depth: Significant positive correlation in developing stage were recognized at 4 stations in forest steppe around Hengey mountains. It is suggested that melting snow would contribute to growth of plants in these stations.

Correlation coefficient at Mungenmorit is over 0.8 from November to February, and maximum is 0.96 in January. However, the snow-depth effect is limited to a narrow region. Mungenmorit is located in the small basin, and the range that the melting-snow water influences would be narrow due to such geographical feature.

Significant correlation was not found in mature stage.