

The Relationship between Outbreak of Asian Dust and Ground Condition in East Asia

Feifei Cui^{1*}, Akihiko Kondoh²

¹Graduate School of Sciences, Chiba Univ., ²CEReS, Chiba University

In East Asia, dust is called yellow sand and is especially a symbol of spring. Not only from a scientific viewpoint but also from a standpoint of environmental problems, it is considered as an important problem to discuss the generation factor. Although dust is a natural phenomenon, it is causing the disaster.

According to the observation total days of dust in Japan, which has been made public by the Japan Meteorological Agency, the observation days are greatly different depending on the year. The number of dust events observed in Japan increased in 2000, and continued to 2002, following sharp drop in 2003. There must be a cause in such a rapid change. It is thought that the factor includes both an atmospheric side and a ground level side. In this study, we will focus on the state of the surface condition at ground level, and aim to clarify the change in the ground condition, which corresponds to the changes in the dust observation days. So, we discussed the relationship between outbreak of dust and the ground condition, with monitoring the state of surface condition by satellite data and with analyzing the meteorological data.

As satellite data, we used SPOT/VEGETATION 1km 10-day composite data, which can be downloaded free of charge from the following URL "<http://free.vgt.vito.be/>." Each data file is comprised of 10-day maximum-value composite (MVC) NDVI bands. The sensor has 4 spectral bands: blue, red (R), near-infrared (NIR), and mid-infrared (MIR). We can extract the information on the snowfall and vegetation from these band data. The red and NIR bands are used to characterize vegetation with normalized difference vegetation index $NDVI = (NIR - R) / (NIR + R)$. The map of timing of foliation of vegetation created for each year by expediently using $NDVI = 0.1$ as a threshold. And the red and MIR bands are used to characterize snow with normalized difference snow index $NDSI = (MIR - R) / (MIR + R)$. A value of 0.2 was used as a threshold based on Kondoh and Suzuki (2005) for the identification of the snowfall region and non-snowfall region.

In the semiarid area in east Asia, the period of bare land is able to be made a map by taking the difference of thaw and foliation each year. There seems to be a good correlation between the two when the length of the bare land is compared with the dust observation total days each year. So, we choose the meteorological observing station in Inner Mongolia of China, to do the same. As the result, when the length of bare land was long, the dust observation was high.

In the year of the longer bare land duration, the thaw was earlier and the average temperature of spring was higher. Therefore, it is thought that early thaw is correlated with the higher temperature of the snow melting period. On the other hand, the foliation in the year of earlier thaw is later. In East Asia spring is dry season when precipitation is a little. In the semi-arid area, the growth of herbs depends on the moisture condition (Kondoh et al., 2005). Therefore, in the year of earlier thaw, it is possible that dryness controls the germination and growth of the herbs vegetation.

In the future, it is necessary to spatially verify the hypothesis that we obtained, based on the feature of the region. If this hypothesis is correct, when being progress in the future, there is a possibility that global warming gives a negative impact to the meadow ecosystem, and the incidence of dust rises, too.

Keywords: yellow sand, East Asia, interannual variation, ground condition, snow extinction, foliation