

MONITORING OF LAND SURFACE TEMPERATURE CHANGE OF THE NORTHEAST REGION IN CHINA BY MODIS DATA

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Abstract: Using received northeast region in China of Terra/MODIS data at Tokyo University of information Sciences. Make monthly division Land Surface Temperature maximum composite image. Using monthly division Land Surface Temperature maximum composite image, considered characteristic of monthly variation of Land surface temperature and relation with land covering and NDVI at the northeast region in China.

Keywords: Land Surface Temperature

1. INTRODUCTION

Land surface temperature image by MODIS is a physical parameter of fluctuation process of an earth surface in local scale and in global scale. It is thought that a good indicator such as energy balance in an earth surface and greenhouse effect. Soil and canopy temperature of an earth surface are the main constituent to select growth speed of vegetation. Land surface temperature is related to a start and the end of growth. It is also related to transpiration and snowmelt of water. In addition, land surface temperature is used as useful characteristic in land cover classification of global area.

There are two sensors in TERRA one is MODIS and the other is ASTER which is aimed to observe the land surface temperature. As for ASTER, high-resolution data is provided, but swath is narrow and is not suitable for observation of wide area. Otherwise, as for MODIS, resolution is low with 1km, but swath is wide. MODIS can observe the same spot in two times with in 3days. Therefore the image which reduced the cloud effect can be made in wide area.

In this research, LST image by MODIS, the change of LST is compared monthly. And it investigated LST and the land use or concern with climate for the area where there was variation. Furthermore, it investigated about comparison on yearly basis.

2. Analysis data and a research area

In Tokyo university of Information science, it installed a data receiving station of MODIS carried by the EOS-TERRA satellite which United States Natl. Aeronautics and Space Administration launched in December, 1999 and the reception began since November, 2000. the data received by the TUIS was used for the East Asia area.

This research area is in northeastern part and Inner Mongolia of Chinese continent (latitude 38-50 degrees longitude 110-140 degrees). Japanese Islands and the Korean Peninsula were excluded from this research because of lake land use information and much cloud.

The research area, west, north, east high altitude landform and plain at the center. These consist mainly of forest, grassland, sandy area, and city. Altitude is 500-2000m, and land use consists mainly of grassland and dry land. It is a high density forest area in Daxinganling Mountain and Xiaoxinganling Mountain. Land use of Changbai Mountain is also a high density forest. In the high density forest, the occupation rate of fallen leaves forest is high. The Altitude from the central area is from 100 to 200. Land use consists of forest, grassland, dry land and city.

3. Method of experiment

From April 2001 to February 2003 It made Monthly LST image. It was done by NASA's MOD11 (level 2) product of approach. LST image is the data which carried out the atmospheric correction. LST data masked the Cloud (MOD04). The LST data used geolocation data of level 1A for geometric correction. It made monthly composite image with everyday data. According to the data done with in two years:

1. Compare the changes of the monthly data

2. Compare the change of yearly data

4. Result and consideration

Figure 1 is LST variation of a research area. When temperature rises in dry land and grass land during April to June, LST also rises. July to August has highest temperature but LST becomes lower at grassland. Vegetation coverage rate is low in spring, and therefore, in grassland, LST influences the temperature. However, there is a little influence of temperature in summer because vegetation coverage rate is high. July to August is the peak of growth of grassland so it causes the LST to be low. In June the LST is in the highest while the temperature in August is highest (figure 2).

September and October is the time when season changes from autumn to winter. In September, there are certain location that LST is high in dry land and grassland. In October LST becomes lower from the northern part. From November to December becomes cold winter and a wide range in the northern part is covered with snow. From spring to autumn, LST does not change much in the area where the high density forest is high. The high density forest is mainly fallen leaves forest. In winter, LST and temperature drop. In the plain area, the LST is higher than in other area. In the big city, it is thought that LST has large quantity of radiant energy. In addition, as for the plain area, the altitude of the surrounding is high therefore it prevents the cold air from the north (figure 3).

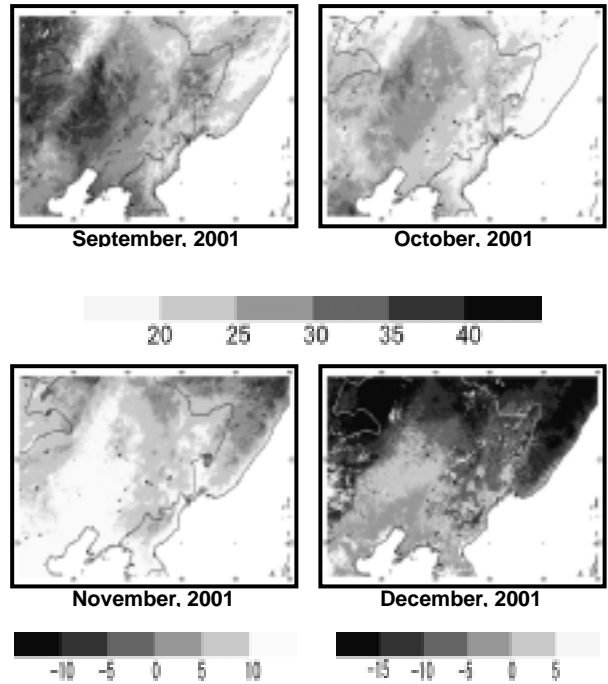
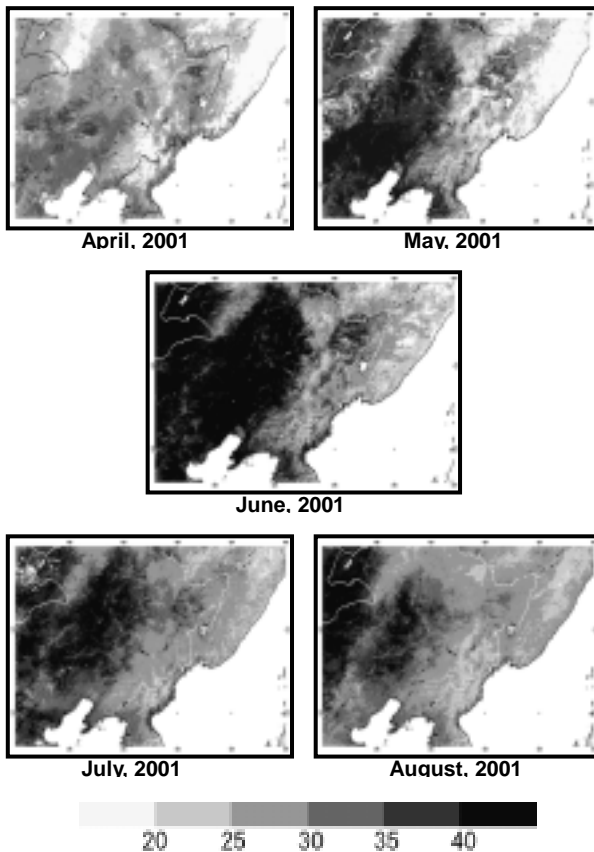


Figure1. Land surface temperature changes since April to December, 2001

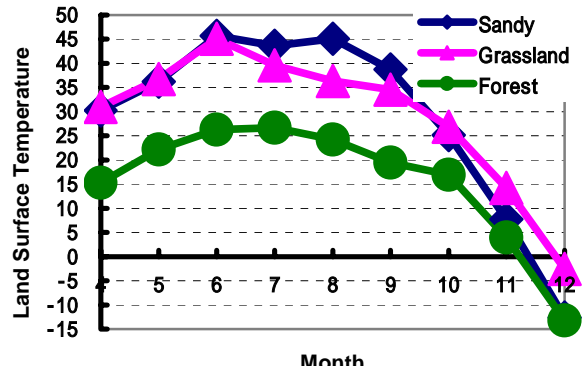


Figure2. Sandy and Grassland and Forest land surface temperature change in 2001

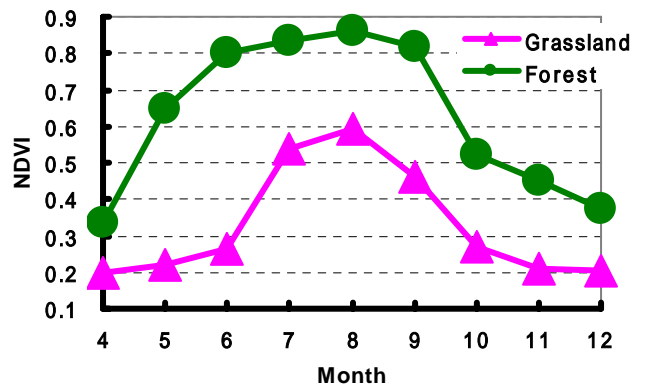


Figure3. Grassland and Forest NDVI change in 2001

The variation of LST in the year 2001 and 2002 is compared. There was not much big change of LST from April to October, but in November 2002 LST decreased. According to the Chinese meteorological office, average temperature in November, 2002 drops as compared to that in November, 2001 (figure 4). Figure 5 is the difference of the image of LST in November, 2002 and November, 2001.

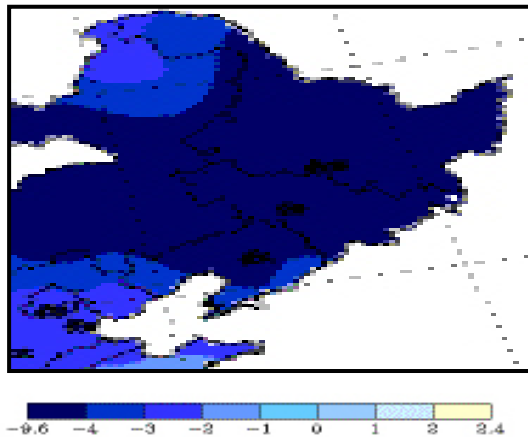


Figure4. The difference of the image of Temperature in November, 2002 and November, 2001

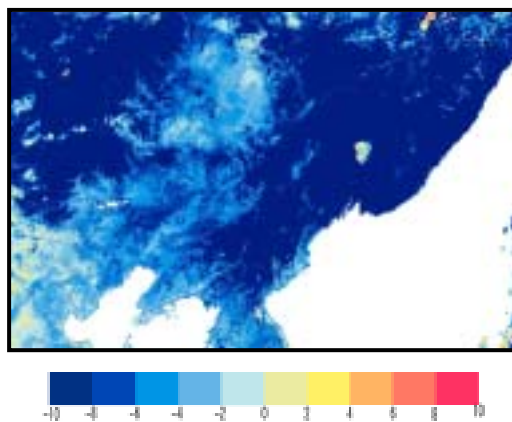


Figure5. The difference of the image of LST in November, 2002 and November, 2001

5. Summary

It made LST image with MODIS data and monthly compared the changes of LST. It considered the LST, the land use and climate. Furthermore, it investigated the comparison of yearly change. The result, as for the LST variation pattern of the year, in May and in June have the highest LST in northeastern China. As for LST in grassland, July and August are lower than in May and June. In winter, the LST in the central part (plain

part) is higher than the surrounding. The LST in winter of 2002 is lower than that of 2001.

In this research, it uses the 10:30 a.m. observation data by TERRA. It is necessary for a future theme to investigate variation of LST with the data of AQUA observed in the afternoon.

Acknowledgement

This research was conducted as part of the "Academic Frontier Research project".

References

- [1]. ZHENGMING WAN, MODIS Land-Surface Temperature Algorithm Theoretical Basis Document Version 3.3
- [2]. ICESS : MODIS Land Surface Temperature Group
MODIS LST Products Users' Guide
http://www.icesc.ucsb.edu/modis/LstUsrGuide/usrguide_index.html