SPATIAL AND TEMPORAL DISTRIBUTION PATTERN OF FIRES IN CHINA USING MODIS DATA

QIN Xian-lin[1], LI Zeng-yuan[1], ZHANG Zi-hui[2]

(1. Research Institute of Forest Resource Information Technology, CAF, Beijing 100091, P. R. China;

2. Information Center of Forest Fire Prediction and Monitoring, State Forestry Administration, Beijing 100714, P. R. China)

Abstract: Fires are a natural disturbance worldwide, being responsible for an important share of global greenhouse gas emissions, land use change and soil degradation. Fires also have positive feedbacks in the vegetation natural succession and soil properties, but these effects are very much dependent on fire intensity and duration. In fact, the spatial and temporal distribution pattern of fire is very important to protect environment and resources, especial to control the greenhouse gas emission from biomass burning. In the past, there are only the statistical data of forest fires and grass fires in China. People usually study on the pattern of forest or grass fires according to the number, burned area and on fire time of forest or grass in different province of China, but it couldn't answer the spatial pattern of forest or grass fires. Because the statistical data usually don't include the information of longitude and latitude of forest or grass fires; In addition, there are many farming fires in China every year. Of course, it couldn't answer the spatial and temporal distribution pattern of fire in China too. Satellite remote sensing and Geography Information System (GIS) technique has supplied instrument to study the spatial and temporal distribution pattern of fires occurred in China. In order to get spatial and temporal distribution pattern of fire in China, MODerate resolution Imaging Spectroradiaometer (MODIS) images have been selected.

To get the fire point of China, the MOD14 fire production relative MOD03 data which covers China has been downloaded from NASA website. We use the program to get the fire point day by day from Feb. 1, 2000 to Aug. 31, 2009 by combing the MOD14 and MOD03 data. Then these points have been geo-located and translated to shape format in ArcMap 9.3 software. To get the name of county and vegetation type of fire point, the vector of

administrative map and vegetation map, which scale is 1:1,000,000, has been used. Every fire point can be assigned county and vegetation type by using join command in ArcMap9.3. Based on the preprocessing, everyone fire point has been translated to shape format, which include the field of longitude, latitude, province, county, vegetation type and other fields.

The mission and commission of fire point have been verified by using the typical fires in the same period. It shows that there are nearly 90% fire points are truth; but, about 15% fires have been missed because the cloud, on fire time and satellite orbit.

Spatial and temporal distribution pattern of fire was analyzed by using the statistic analysis and GIS spatial analysis methods using the truth fires point from Feb. 1, 2000 to Aug. 31, 2009. The results indicated that annual fire points varied significantly year to year, but the general trend was gradually increasing. There are two peak fire period, one is from December to February next year; One is March to June; the other is September to October. From fire points' location analysis, the spatial distribution characteristics of the fires were obviously. Most fire sites lay in the edge zone between the plain and the farm land. There was an irregular distribution of the fires in each district and county. It shows that the fire points mainly locate the province in south, southwest and north-east of China. The total fire points of Heilongjiang, Inner Mongolia, Yunnan and Guangdong is largest than other provinces in every year from year 2000 to 2009. But, the fire points are very small in west region of China, such as Qinghai province. From fire density analysis, which calculated by using total fire numbers divided the area of province, the result shows that the fire density of Zhejiang province is the largest than other provinces of China. We also analyzed the infection of road, river and population. It shows that the farther from the road, the less the fires taken place; but it is just reverse by the river. The larger the population density, the more the fires happened.

Key words: Fires; MODIS; Spatial and temporal distribution pattern