Risk assessment of drought disaster for maize based on integrating multi-sources data

*Xiaojing LIU[1,2], Qinxue WANG[1]

1. National Institute for Environmental Studies, 2. Jilin Normal University

Risk assessment of drought disaster can promptly provide the development of drought and the accurate decision basis for prevention and reduction of disaster for government and farmers. The traditional studies on drought disaster risk were based on the ground point data, which were unable to realize the continuity of space and the timeliness. However, remote sensing data in adequate spatial and temporal resolution can overcome these limitations, and can better monitor the crop in large area dynamically. This study presents a methodology for dynamic risk analysis and assessment of drought disaster to maize production based on remote sensing data and GIS from the viewpoints of climatology, geography and disaster science. The case study area was the northwest of Liaoning Province in China, where the maize sown area accounts for 67%, and the frequency of drought occurrence in 30 years (1980-2009) is more than 50%.

A model of dynamic risk assessment of drought disaster was established based on risk formation theory of natural disaster, and the expression of risk by integrating multi-sources data, such as precipitation anomaly percentage (PAP), landform slope, soil types and land use types, as well as vegetation condition index(VCI) and temperature condition index(TCI). The model has been verified against reduction in maize yield caused by drought.

The results showed that: (1) there was a low risk for maize in the north and an extremely high risk in the south and west during the sowing stage; (2) although the low-risk area declined and extremely high-risk area increased, there was a trend of polarization that low risk was in the northeast and extremely high risk was in the southwest in the seedling stage; (3) the south of the study area had extremely high drought risk in the jointing stage; (4) there was especially worst drought in the west and central parts in heading stage; and (5) the rainfall decreased from east to west, and the least rainfall was in the central parts which suffered the most serious drought in the filling-ripening stage. These results obtained in this study can provide the latest information of regional drought disaster and the decision-making basis of disaster prevention and mitigation for government management and farmers.

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Keywords: risk assessment, drought disaster, maize, multi-sources data, Liaoning Province in China

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