Multi Satellites Monitoring of Land Use/Cover Change and Its Driving Forces in Kashgar Region, China

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The spatio-temporal changes of Land Use/Cover (LUCC) and its driving forces in Kashgar region, Xinjiang Province, China, are investigated by using satellite remote sensing and a geographical information system (GIS). Main goal of this paper is to quantify the drivers of LUCC. First, considering lack of the Land Cover (LC) map in whole study area, we produced LC map by using Landsat images. Land use information from Landsat data was collected using maximum likelihood classification method. Land use change was studied based on the change detection method of land use types. Second, because the snow provides a key water resources for stream flow, agricultural production and drinking water for sustaining large population in Kashgar region, snow cover are estimated by Spot Vegetation data. Normalized Difference Snow Index (NDSI) algorithm are applied to make snow cover map, which is used to screen the LUCC and climate change. The best agreement is found with threshold value of NDSI≥0.2 to generate multi-temporal snow cover and snowmelt maps. Third, driving forces are systematically identified by LC maps and statistical data such as climate and socio-economic data, regarding to i) the climate changes and ii) socioeconomic development that the spatial correlation among LUCC, snow cover change, climate and socioeconomic changes are quantified by using liner regression model and negative / positive trend analysis. Our results showed that water bodies, bare land and grass land have decreasing notably. By contrast, crop land and urban area have continually increasing significantly, which are dominated in study area. The area of snow/ice have fluctuated and has strong seasonal trends, total annual snow cover has two peaks in 2005 and 2009. With increasing population from 2,324,375 in 1984 to 4,228,200 in 2014 and crop land reclamation from 6031.4 km^2 in 1972 to 16549km^2 in 2014 at the study area. Water resources consumption increased with support to large population and irrigate whole crop land area, caused the water shortages that the surface water bodies decreased from 2531.43km^2 in the 1972s to 1067.05km^2 in the 2014. The grass land with an acreage larger than 6749km^2 in 1972 decreased to 922.6 km^2 in 2014. The transformations between water bodies, garss land and bare land are remarkbale. The results also suggested high linearity between the LUCC and socioeconomic changes that specific land cover change be cause of the fact that socioeconomic development. In the recent 42 years, average annual temperature have been increasing significantly, although, precipitation have increased but partly weaken effect of the rising temperature, in addition snow cover more sensitive to precipitation than temperature.The change of climate showed a nagitive relationship between snow cover with decreased and climate with increasing of the tempreature. Morover, the relationship between the LUCC and snow cover recorded higher linearity, because the temperature have increased, consequence influence on snow cover that provides melt water for study area which expanding crop land.

Keywords: LUCC, Driving forces, Snow Index, SPOT vegetation, Kashgar Region

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