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Variations in vegetation activity across the Northeast China during 1982∼2006

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Normalized Difference Vegetation Index (NDVI) is well indictor of vegetation activity. In this research, we performed a rotated factor analysis on the seasonal cycle of NDVI to classify the vegetation across Northeast China; and then, we investigated the variations in vegetation activity of each individual type of vegetation. The results demonstrate that needleleaved forest (NF), mixed needleleaved and broadleaved forest (MF), cropland (CP) and sparse vegetation area (SV) account most area of Northeast China. In spring (April-May), activities of forests (MF and MF) had the large inter-annual variations, while the inter-annual variations in activities of CP and SV were little. The forests' activities increased significantly during 1982-2000. This phenomenon is consistent with the advanced green-up of vegetation in spring, which was attributed to climate warming. Dramatically, the vegetation activities started to be weak after the 2000. This variation feature had little been indicated by previous studies. In summer (June-August), the CP and SV had larger inter-annual variations in activities than NF and MF. The activities of CP and SV enhanced during 1982-1992 and weakened during 1992-2006. In autumn, the activities of MF, NF, CP and SV experienced similar variations, which were characterized by abrupt enhance around the 1995. To identify the potential relations between variations in vegetation activities and climate change, we carried out correlation analysis on the NDVI time series and temperature and precipitation series. We found that vegetation activities of forests in spring were positively correlated with spring temperature; while, the activities of SV was positively correlated with precipitation. In summer, the activities of NF, MF, CP and SV were positively correlated with precipitation and negatively correlated with temperature. In autumn, there are no steady and significant correlations.
All these findings demonstrate that the variation in vegetation activities varied with vegetation types and with seasons. The differences among vegetation types were only represented as different variation amplitudes; while, the differences among seasons were mainly represented as different variation pattern. These differences on one hand could be explained by plants types and on the other hand it also was associated with key climate factors and their variations. However, statistical findings are uncertainties. For instance, temperature changes in spring was significantly correlated with activities and climate warming could explain enhanced vegetation activities during 1982-2000; however, this statistical finding was unable to explain weakened vegetation activities and enhanced climate warming after the 2000. So, further study through other ways such as field experiments and numeric experiments are needed.