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Influences of topography and climate on vegetation distribution over mainland China

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This study addresses the relationship of vegetation distribution with topography and climate through using the Moderate Resolution Imaging Spectroradiometer (MODIS) MOD13A1 products. The research data include the enhanced vegetation index (EVI), climate data (such as precipitation, temperature, solar radiation) and topographic data (such as elevation, slope, aspect, topographic index and the distance to the nearest river), and the study period is from 2001 to 2012 (12 years). Using a data mining approach, the EVI data and topographic data, the study separates mainland China into different ecological zones. The result reveals that elevation is the predominant factor in controlling the separation of ecological zones in different months. In different months, the first turning points of the elevation for division of ecological zones are higher in the wet season than those in the dry season. In a growing month (April) and a falling month (Nov), the number of ecological zones is larger than that in the other months. The relationship between EVI and climate data are also investigated using their correlation coefficients. In South China and Northeast China, the correlation coefficients of EVI with temperature and solar radiation are positive in most months, especially in summer. On the contrary, the correlation coefficient of EVI and precipitation is negative in South China and positive in North China. These phenomena indicate that the photosynthesis of vegetation in South China is enhanced due to more solar radiation and warmer temperature. Meanwhile, the southern trees are able to use deep roots and hydrologic redistribution to access and sustain water availability during dry seasons. This study discloses that in the growing season, the vegetation greenness in most areas of South China is mostly influenced by solar radiation. In addition, the study shows that there are different relationships between vegetation distribution and the climate data in different ecological zones. The ecological zones with the higher elevation can more dynamically respond to climate change than those with the lower elevation.