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TEMPORAL AND SPATIAL VARIABILITY OF VEGETATION IN SOURCE REGION OF THE YANGTZE RIVER USING EMPIRICAL ORTHOGONAL FUNCTION (EOF) ANALYSIS OF REMOTE SENSING DATA

Abstract

This study investigated the characteristics of spatial and temporal variability of vegetation and evaluated the relative roles of various affecting factors in source region of the Yangtze River by means of Empirical Orthogonal Function (EOF) and wavelet decomposition analysis. The main remote sensing data was Global Inventory Modeling and Mapping Studies (GIMMS) Normalized Difference Vegetation Index (NDVI) that from 1982 to 2003, and the May-September data were used for the EOF analysis that focused on the spring bloom. Three principal modes, which explain about 77% of the total variance, have been identified. The first EOF mode explains 70.51% of the variability and shows that major vegetation coverage change is spatially consentaneous, but the amplitude of southwest region is higher than northeast. At the time series, there is obvious seasonal and interannual cycle time and May reaches the peak value of time coefficient. The second EOF mode (3.72%) indicates that the spatial pattern corresponds with the hydrogeological unit distribution. By wavelet decomposition, the second series have 3-4 years and 22 years cycle, which is correlated with the period time of baseflow as the sign of groundwater capacity in source region of the Yangtze River. The third mode (2.33%) which the spatial structure presents west north west- east south east (WNW-ESE) banded and the time coefficient shows more than 40 years long cycle is seen to be significantly correlated with topography characteristics. In conclusion, at the seasonal scales the major variability of coverage in source region of the Yangtze River is controlled by May vegetation germination and growth change, and the long-period evolution of vegetation depends on hydrogeological and topographical conditions.

Key words: source region of the Yangtze River, empirical orthogonal function (EOF), wavelet decomposition analysis, vegetation