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论文

太湖流域降水、气温与径流变化趋势及周期分析

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摘要:

基于太湖流域及周边气象站1957—2009年气象数据,采用Mann-Kendall和小波分析方法,分析其平均气温、极端最高和最低气温、降水量、最大日降水量及径流量的变化趋势和周期特征,并对流域径流量的变化及与降水量的耦合关系等进行分析。结果表明:太湖流域在过去50多年整体呈增温增湿的趋势;靠近大城市的站点气温升温趋势明显高于其他站点;流域夏季的极端高温事件有增强的趋势;流域年降水量呈不显著的增加趋势,而最大日降水量却呈显著的增加趋势,从一定程度上反映出流域内极端降水有增强的趋势;降水量和径流量的变化趋势较为一致,都呈不显著的增加趋势,且两者增加幅度基本相当;流域各要素存在约4 a的显著振荡周期和8 a的不显著振荡周期。

关键词: 水文 小波分析 Mann-Kendall 太湖流域

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Trend and Periodicity of Precipitation, Air Temperature and Runoff in the Taihu Lake Basin

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Abstract:

Trend and periodicity of mean air temperature, maximum air temperature, minimum air temperature, maximum daily precipitation, precipitation, and runoff over the Taihu Lake Basin, which is one of the most developed regions in China, were analyzed in this study. The non-parametric Mann-Kendall test and Morlet wavelet were used to detect trends and periodicity of major hydro-climatic variables respectively. Results showed that air temperature experienced an increasing trend, while precipitation and runoff exhibited a decreasing trend during the past 50 years. Air temperature of stations located near big cities showed much greater increasing trends than that in other stations, which might be due to urban heat island effect. Maximum air temperature in summer, a season with the highest air temperature in a year, showed much greater increasing trends than mean and minimum air temperature. It was included that extreme higher air temperature events in summer exhibited an increasing trend during the past 50 years. Although annual precipitation in the basin exhibited an insignificant increasing trend, maximum daily precipitation did show an increasing trend which is significant at 95% confidence level. It indicated that extreme higher precipitation events (storms) also experienced an increasing trend in the past. Trends of runoff were similar with that of precipitation. Both of runoff and precipitation showed insignificant increasing trends, and magnitude of these trends was with little difference. There existed significant periods of about 4 years and insignificant periods of about 8 years for all six hydro-climatic variables at 95% confidence level, included mean air temperature, maximum air temperature, minimum air temperature, maximum daily precipitation, precipitation, and runoff over the Taihu Lake Basin.

Keywords: hydrology Morlet wavelet analysis Mann-Kendall test Taihu Lake Basin

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