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站点密度及插值方法对**ET0**空间插值精度的影响

Effects of spatial station density and interpolation methods on accuracy of reference crop evapotranspiration

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中文摘要:

流域参考作物蒸发蒸腾量（ET0）插值方法的研究对流域尺度作物耗水时空变化规律有重要意义。该文通过海河流域162个国家农业气象站3a（2003－2005年）旬值气象资料，利用Penman-Monteith公式计算了这些站点ET0，采用ArcGIS软件中常用的Spline、IDW和Ordinary Kriging（OK）法，以及近些年研究较多的线性回归Regression插值法，对不同站点密度条件下的ET0进行空间插值。分析了各空间插值方法在不同站点密度条件下的优劣性，并且给出了本流域内各种站点密度范围条件下计算ET0最适宜的插值方法。结果表明以站点密度1.3个/万km2为界，当站点密度低于此密度时，推荐使用Regression插值法；当站点密度大于1.3个/万km2时，推荐使用IDW和OK插值法；当站点密度大于4.3个/万km2，以上三种插值法并无显著差别；不推荐使用Spline插值法。

英文摘要:

Abstract: With the intensified global climate change and increased human activity, water resources deficit and consequent imbalance between water supply and demand tends to be more serious. Research on water cycle and its spatial and temporal evolution under changing environment has attracted growing concerns. Evapotranspiration (ET) is not only an important component in the water cycle and water-heat balance, but also an important process in coupling and simulation interaction with the soil-atmosphere system and in the land-atmosphere system. ET is also an important basis for scientific assessment, management of water resources, and planning and design for agricultural water conservancy project, and thus attracted interests from the disciplines such as hydrology, water resources, agricultural irrigation, agricultural ecology, physical geography, and agro-meteorological. Research of interpolation models of reference crop evapotranspiration (ET0) is important to the temporal and spatial distribution of water resource in river basin scale. Haihe River basin located at the north China is one of the seven largest river basins in China, occupying an area of 3.2×105km2(34.9° -42.8° N, 112.0° -119.8° E). The middle and lower reach of the basin is one of important wheat production regions in China. This region in subtropical monsoon climate, semi-humid and semi-arid environment is strongly affected by human activities. In recent decades, several eco-environmental problems have become prominent under the combined impacts of climate change and intensified human perturbations. Water resources in Haihe are currently used for irrigation, aquaculture and industries. Due to very limited available water resources in the basin, water has been diverted from other basins to supply water to agriculture and to maintain the essential functions of the ecosystem. The ten-day average maximum air temperature and minimum air temperature, relative humidity, sunshine hours, wind speed were used to calculate ET0 using the Penman-Monteith equation recommended by FAO in 1998. We calculated ET0 using Penman-Monteith equation which was recommended by FAO according to weather data of 3 years (2003-2005) for 162 agricultural weather stations in the Haihe river basin. The temporal and spatial vatiations of ET0 were calculated by four interpolation models of Spline, Ordinary Kriging (OK), Inverse Distance Weighted (IDW) and Regression in ArcGIS. The results showed that when the spatial stations density is less-than 1.3 station every 10 000 km2, the Regression interpolation model was better than the other 3 interpolations; the OK and IDW model were recommended when the spatial stations density is greater-than 1.3 and less-than 4.3 station every 10 000 km2; when the spatial stations density is greater than 4.3 station every 10 000 km2, the results showed no big difference for three interpolations (OK, IDW, Regression). Spline method showed the worst results. In a word, Regression interpolation model presented higher accuracy if the spatial stations density is less-than 1.3 station every 10 000 km2; the OK and IDW interpolation model presented higher accuracy if the spatial stations density is greater than 1.3 and less than 4.3 station every 10 000 km2.

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