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降尺度土壤水分信息与植被生长参量的时空关系

Space-time analysis on downscaled soil moisture data and parameters of plant growth

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作者	单位
王安琪1,2	1. 首都师范大学资源环境与旅游学院，北京 100048； 2. 中国科学院遥感应用研究所，北京 100101
施建成2	2. 中国科学院遥感应用研究所，北京 100101
宫辉力1	1. 首都师范大学资源环境与旅游学院，北京 100048
解 超3	3. 北京大学遥感与地理信息系统研究所，北京 100871

中文摘要:

土壤水分是重要的水文参量，多源遥感数据协同反演土壤水分是今后的发展方向。整合被动微波和光学数据，可有效发挥其各自的时空分辨率优势。该文以官厅水库库区及周边区域为研究区，选取该区域2010年全年AMSR-E土壤水分产品与MODIS数据，利用归一化植被指数NDVI，地表温度Ts和反照率Albedo，采用多元回归的方法，将空间分辨率为25?km的AMSR-E土壤水分数据进行分解，得到周期为16?d的1?km平均表层土壤水分的时间序列数据。并结合土地利用类型和热带降雨测量卫星TRMM累积降雨量产品，选择Spearman和Pearson相关系数，分析了植被生长期和全年两个时间段，不同地物类型下土壤水分与植被指数、累积降雨量等植被生长参量之间的关系。结论表明在非人工灌溉区，土壤水分与累积降雨量相关性明显。在人工灌溉区，土壤水分的变化与降雨量存在变化的不一致性。同时研究证明了表层土壤水分变化的植被滞后响应，这种滞后性与植被对根区土壤水分的延后反应相关，且不同植被类型的滞后时间不同。

英文摘要:

Soil moisture is an important hydrological parameter, and inversion of soil moisture collaborated by multi-source remote sensing data would be the trend in the future. Utilizing passive microwave and optical data, the advantage of spatial and time resolution can be effectively integrated. This paper selected AMSR-E soil moisture product and MODIS data of the study area, which covers Guanting Reservoir and the surrounding areas throughout the year 2010. NDVI, land surface temperature (Ts), and Albedo, multiple regression method has been applied to conduct analysis on AMSR-E soil moisture data having a spatial resolution of 25km. As a result, a group of time series data featuring a cycle of 16 days and average surface soil moisture of 1km was obtained. By taking account into the type of land use and TRMM cumulative rainfall product, relevant data of Spearman and Pearson was selected and the analysis was conducted on the relationship among vegetation growth, cumulative rainfall and soil moisture, separately for different types of land cover during vegetation growth period and two other time periods throughout the year. The conclusion showed that on non-irrigated land, evident correlation between soil moisture and cumulative rainfall could be identified. On irrigated land, changes in soil moisture and that of cumulative rainfall were inconsistent. The average soil moisture of different types of land cover in the study area was closely related to maximum NDVI value; while without distinguishing the vegetation type, the correlation diminished. The research showed the vegetation’s response lag from the surface soil moisture’s change and this lagging characteristic had to do with the vegetation’s delayed response on the root zone’s soil moisture, and the extent of lagging would vary among different types of land cover.

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