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研究报告

植被叶片及冠层层次含水量估算模型的建立

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摘要

利用LOPEX'93数据库中67个鲜叶片含水量Cw和光谱反射率实测数据，基于光谱指数法,在叶片层次,用47个随机样本建立Cw与不同光谱指数的统计模型，并用另外20个样本验证.结果表明,Cw的两种表征形式相对含水量FMC和等价水深EWT在提取叶片Cw时差异较大，EWT与各光谱指数的相关性较FMC高，但FMC对叶片Cw的反演精度高于EWT.而反演精度更高的是基于最优子集回归建立的光谱指数线性模型.Ratio975是叶片层次提取Cw的普适光谱指数.冠层层次，利用PROSPECT + SAILH耦合模型，模拟在不同叶面积指数LAI和Cw下的冠层光谱.为了剔除背景影响，更好地提取冠层Cw，提出用近红外和短波红外波段反射率构造土壤可调节水分指数（SAWI），该指数与其他光谱指数的比值能明显地剔除土壤背景影响，更准确地提取冠层Cw.Ratio 975 的改进型光谱指数(Ratio975-0.96)/(SAWI+0.2)能用来提取叶面积指数 LAI从0.3到8.0，Cw从0.0001cm到0.07cm的冠层Cw，研究表明精度较高.

关键词 光谱指数法,含水量,土壤可调节水分指数

分类号

Estimation models for vegetation water content at both leaf and canopy levels

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Abstract

Based on spectral indices method,this paper utilized the water content (Cw) and reflectance data of 67 fresh different type leaves from LOPEX'93 database to establish the statistical model between leaf Cw and spectral indices at leaf level through 47 samples,and to test the model with the other 20 samples.The results suggested that fuel moisture content (FMC) and equivalent water thickness (EWT) as Cw demonstrators were different in reflectance spectral curves.The difference between FMC and EWT was large when they were utilized to retrieve the leaf Cw.The correlation coefficient between EWT and each spectral index was higher than FMC,but the forecast precision of FMC was better than that of EWT.The 7 spectral indices could all retrieve the leaf FMC accurately,but only the Ratio975,II and SR were suitable to estimate the leaf EWT.Spectral indices linear model on the strength of optimal subset regressions had the highest precision to retrieve the leaf Cw.Ratio975 might be the universal spectral index to estimate
the leaf Cw.At canopy level,the simulated canopy spectra under different leaf area index (LAI) and Cw were derived from the PROSPECT and SAILH coupling models.In order to eliminate background influence and to precisely retrieve the Cw,soil-adjusted water index (SAWI) was

proposed at the first time to indicate the information of near-infrared and short-wave infrared canopy reflectance.The ratio of SAWI and other spectral indices could dramatically eliminate the soil background,and effectively retrieve the vegetation Cw at canopy level.Spectral index (Ratio975-0.96)/(SAWI+0.2) as improved Ratio975 could be used to compute the canopy Cw more precisely when LAI was ranging from 0.3 to 8.0 and Cw from 0.0001 to 0.07cm.

Key words Spectral indices method Water content Soil-adjusted water index

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