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不同土壤含水率、体积质量及光谱反射率的关系模型

Relationship model among water content, bulk density and reflectivity of different soil

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中文关键词：土壤,近红外光谱,含水率,反射率,湿胀干缩型土壤,土壤体积质量

英文关键词:soils near infrared spectroscopy water content reflection wet expansion and dry shrinkage type soil soil bulk density

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中文摘要:

为了准确、快速地检测湿胀干缩型土壤含水率，该文提出了基于近红外光谱技术的土壤含水率分析方法。该文以湖北省黄棕壤、潮土、水稻土为研究对象，利用美国Ocean Optic公司的NIR256-2.5微型光纤光谱仪在暗室环境下对不同含水率下的土壤样本进行光谱反射率的测定和特征分析，并同时测量相应的土壤体积质量，研究土壤含水率、体积质量、光谱反射率之间的相关关系，通过采用2种土壤含水率表示方法与3种土壤光谱反射率表示方法反映土壤含水率与光谱反射率之间关系的对比试验分析，消除土壤其它性状对土壤反射率反演土壤含水率的影响,得到较适宜地进行土壤光谱反射率反演土壤含水率的匹配表示方法,构建三者之间关系的曲面模型和体积质量变化的土壤体积含水率与土壤光谱反射率的关系指数模型。研究结果表明，构建的3种土壤的曲面回归模型，决定系数均大于0.977，F值均达极显著水平，光谱反射率与体积质量的偏回归系数检验亦达显著或极显著水平。采用指数模型表述1 400、1 900 nm波长处的归一化减土光谱反射率与体积质量变化的土壤体积含水率的关系，其决定系数均在0.9以上，对模型进行验证,其预测误差在0.3左右，精度较高，所建模型拟合效果好。该研究可为用近红外光谱检测体积质量变化的土壤含水率提供科学资料。

英文摘要:

The aim was to find out a way to measure wet expansion and dry shrinkage type soil moisture accurately and rapidly, and a method was proposed to analyze soil moisture base on near-infrared spectroscopy(NIRS). Taking yellow brown soil, Chao soil and rice soil in Hubei province as study objects, the spectra of soil samples with different soil moisture content were measured by NIR256-2.5 micro fiber spectrometer of Ocean Optic company in America in the dark room environment, corresponding soil bulk density was measured at the same time, relationship among soil water content、bulk density and spectral reflectivity was researched. Through comparative tests analysis reflecting the relationship of soil water content and spectral reflectivity by use of two soil water content representation methods and three soil spectral reflectivity representation methods, effect of soil other characters on soil reflectivity retrieval soil content was eliminated, suitable soil spectral reflectivity inversion of soil water content matching method was obtained and the surface model of such relationships and the exponent relationship model between soil volume water content of bulk density change and soil spectral reflectivity were constructed. The results showed that decision coefficients of three kinds of soil surface regression models constructed were more than 0.977, F values reached extremely significant level, and spectral reflectance and the bulk density of the partial regression coefficient were also significant or extremely significant level. The decision coefficients of exponent relationship model between soil volume water content of bulk density change and normalized reducing soil reflectivity at 1400 and 1900nm wavelength were more than 0.9, and the forecast errors were about 0.3 when the exponent model was verified and the precision was relatively good，so the built models had a good fitting effect. This study can provide a scientific reference for using near infrared spectroscopy to detect bulk density variable soil water content.

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