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地面观测方案

田块尺度作物辐射温度获取方法对比研究

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摘要：

热像仪的优势在于可以获得组分辐射温度，常用于地面温度同步测量实验中，其数据与植被覆盖度联合还可以得到作物田块尺度的平均辐射温度。以黑河流域进行的星—机—地遥感综合观测试验加密观测——盈科绿洲玉米地的热像仪和手持式红外辐射计温度测量数据为基础对不同采样方式获得的地面辐射温度进行对比。对于热像仪数据：①采用阈值法对热像仪影像中的玉米和土壤背景两组分进行分离，获得了各自辐射温度的平均值;②利用LAB彩色变换法处理同步拍摄的真彩色照片，获得每块玉米样地的植被覆盖度;③最终结合组分温度和植被覆盖度求得地块平均的辐射温度。经过实验对比发现，由热红外图像计算获得的地面平均辐射温度与手持式红外辐射计垂直垄或顺垄条带采样获得的地面平均辐射温度差值较小，基本在±1℃以内，而3种测量方式的最大值、最小值相差较多。还模拟了几种常见尺度下利用手持式红外辐射计进行随机采样时，其采样平均值以不同的置信度处于真实温度±0.5℃之间所对应的采样次数。分析表明，基于点测量的采样方案难以仅利用1～2台手持式红外辐射计实现对田块或更大尺度平均辐射温度的准确测量，高时空采样频率是保障地面辐射温度测量精度的前提，与遥感像元尺度相匹配的地面真实性检验需要进行测量方法和设备的革新。

关键词： 田块尺度;辐射温度;热像仪;手持式辐射计;采样方式

A Comparison of Different Ground based Radiative Temperature Measurement Methods on the Field Patch Scale

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Abstract:

Thermal camera，widely used in situ measurement of land surface temperature(LST), has an advantage of obtaining component brightness temperature. A simultaneous airborne, satellite borne, and ground based remote sensing field campaign was carried out in the Heihe River Basin of northwest China from May to July, 2008. The radiative temperatures were obtained by two portable infrared radiometers and one thermal camera at the maize field patches around the weather station in Yingke Oasis Area with three different sampling schemes. Average temperatures of the field patches were extracted with those data. The thermal camera′s data was processed as: Firstly, maize and the soil were separated by statistical threshold of radiative temperatures in thermal images, and then their mean radiative temperatures were calculated, respectively. Secondly, with the LAB color space transform technique, the vegetation fraction of each field patch is estimated from visible photos taken simultaneously. Finally, each patch′s mean radiative temperature was obtained by the sum of the component temperatures of maize and soil weighted by vegetation fraction cover. By comparing of the mean radiative temperatures obtained by the thermal camera and portable radiometers sampling in cross row and along row direction, we found that their differences are small, and between -1 and +1 . But, both maximum and minimum temperatures of the three methods differ a lot. By simulation on different reliability levels, we also obtained the numbers of randomly sampled points on different pixel scales. Our result indicates that it is difficult to obtain an accurate mean brightness temperature of filed patch with just only 1 2 portable radiometers based on the general point based measure scheme. To get more accurate data for the validation of LST retrieved in different remote sensing pixel scales, new methods and instruments with high temporal and spatial sampling frequencies are required.

Keywords: Field patch scale Radiative temperatures Thermal camera Portable radiometer Sampling method.

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