LEAF AREA INDEX INVERSION AND VALIDATION FOR COTTON IN XINJIANG BASED ON THE DMC REMOTELY SENSED MINI-SATELLITE DATA

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1. INTRODUCTION

Crop growth is affected by many factors and is an extreme complex process. Fortunately, there are some index can be used to indicate the growth process, such as leaf area index (LAI). The variability of LAI can integrate various conditions affecting plant growth and development [1]. LAI is one of the key ecological parameters widely used in crop monitoring and yield estimations.

There are many approaches to estimate LAI over large area. One is mapping LAI through the empirical relationship between LAI and vegetation indices (VI) [2,3,4,5,6] Because the reflectance of plant canopies depend on a number of other factors (e.g. soil properties, vegetation type, etc.), no unique relationship between the LAI and vegetation index can be expected to be applicable everywhere and all the time, even for a particular satellite sensor. The common way to mapping LAI is through the inversion of physically based canopy-reflectance (CR) models using the optimization methods [7]. The advantage of canopy reflectance model inversion is that this method has physical foundation and is independent of the crop type. We used the CR model to invert LAI in this paper.

Xinjiang, located in the hinterland of Eurasia with rich light and hot resources, is the biggest cotton planting area in China [8]. It is suitable for Xinjiang cotton to take the remote sensing monitoring for single breed variety, continuous plantation, and dry and little rain weather easy to get fine remote sensing data.

There are large potential for growth condition information for Mini-satellite of Beijing-1' wide scope (600 kilometer), middle spatial resolution (32 meter) , high temporal resolution (2-3 days) and multi-spectral (green band: 520-620nm, red band 630-690nm, near infrared band 760-900nm). We selected the Beijing-1 multispectral data for LAI inversion.

2. METHODOLOGY

For the remote sensing data, firstly, radiation correction is processed for Beijing-1 and TM data sets. Secondly, we made the geometric correction for the data sets. We selected some ground control points from the 1:100000 relief maps to correct one TM data. And then, some other data is corrected based on the corrected TM data. Lastly, atmosphere correction is processed for all the remote sensing data sets.

The model we are used is the canopy reflectance model which made a good balance between the computing efficiency and the inversion precision [9]. It's neither a pure geometric-optical model, nor a traditional radiation transfer model, but a cross model suitable for row-crop. It reserves almost all the influential factors, such as spectrum characteristics of ground and canopy, LAI, clumping effect of different scales, BRDF and so on. It can be used for different wavelengths, and easy for inversion.

We made the LAI inversion based on the CR model and LUT method. We analyze the feasibility of the Beijing-1 for LAI inversion through comparison between the inverted LAI from Beijing-1 and the site-LAI. At the same time, the TM data is also used for LAI inversion considering the scaling problem of the inversion result validation.

3. RESULT AND CONCLUSTION

There are 18 points for LAI measurement at the experiment. We picked up the pixel value at the same location. The mean LAI for experiment and for image is computed. On the whole, LAI distribution of Beijing-1 and TM is almost consistent from the histogram and statistical result for inverted LAI of the BJ-1 data and TM data.

Leaf is the main physical-physiological carrier. LAI is colony index. The LAI is inverted based on the Beijing-1 remote sensing data and TM data. The inverted LAI is validated with the experiment LAI. The result shows that the LAI can be inverted for the Beijing-1 data. Furthermore, the temporal resolution of Beijing-1 is higher than that of TM data. So, it is recommendatory for cotton growth monitoring based on the Beijing-1 remote sensing data.

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