Mapping Leaf Area Index using MODIS data in China

Mapping Leaf Area Index using MODIS data in China

Ronggao Liu[1], Jing. M. Chen[2], Jiyuan Liu[1], Dafang Zhuang[1]
1 Institute of Geographical Sciences and Natural Resources Research, Chinese Academy of Sciences, Beijing, China
2 Department of Geography, University of Toronto, Toronto, Canada
Email: Liurg@lreis.ac.cn

Leaf area index (LAI) is one of the surface parameters that has importance in climate, weather, and ecological studies. It has been extensively investigated to estimate the LAI from remote sensing measurements, but it is still a challenge to map LAI in a large regional scale. There are mainly two methods to estimate LAI from satellite data, one is based on the statistical relationship between LAI and remote sensing bands which is only suitable to local regional scale, and another is from the inversion of physical canopy radiation transfer model which is more optimistic for large scale LAI estimation. In this presentation, a new LAI estimation method from MODIS data is proposed. Since LAI is a key parameter in description of vegetation structure, the satellite bands data may be different for same LAI from different view and sensor angles. The couple of view and sensor angle with satellite bands data may improve the accuracy of LAI estimation. The method is based on the 5-Scale model developed by Jing. M. Chen. MODIS bands radiance were firstly simulated to create lookup table using the 5-Scale model with input of LAI, view angle, sensor angle and landcover-related parameters. Then the LAI was retrieved from MODIS bands data using simulation lookup table. The algorithm was applied to produce LAI maps covering all China using 16-days cloud-free MODIS data. To validate the algorithm and these products, four sites, including Changbaishan, Heihe, Liping and Xingguo, were selected for validation under the support of CIDA projects in 2003. The field measurements use the commercial Tracing Radiation and Architecture of Canopies (TRAC). Landsat Thematic Mapper (TM) scenes at 30-m resolution at the same period were used to locate ground sites and to facilitate spatial scaling to 1-km pixels. It is shown that the accuracy of LAI values of MODIS was more than 80%. Random and bias errors were both considerable. Bias was mostly caused by the prior knowledge data such as the landcover and model predefined parameters error, but the uncertainties in atmospheric correction of remote sensing data were also contributed to MODIS LAI estimation. And, these LAI data were compared with NASA MODIS LAI product. The seasonal LAI changes are also analyzed from 2000 to 2003.