A Study on GPP Inversion of Different Ecosystems by Remote Sensing and Impact Factors Comparison

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1.Introduction

Light use efficiency model is one of the methods to retrieval Globe Primary Production(GPP) using Remote Sensing data. FPAR, PAR and light use efficiency are the main parameters in these models. Which parameters are the sensitive factors of these models? Which methods is the most important problem to be solved? To answer these two questions can help us retrieval GPP better. So in this paper one of a light use efficiency model was used to retrieval five different ecosystem experimental stations' GPP in 2003 in China. The results were compared with MOIDS GPP production and surface measurement results.

2.Data and method

2.1Data and research regions

The five ecosystem experimental stations are Haibei Alpine Meadow Ecological System Station, Inner Mongolia Grassland Ecosystem Station, Qianyanzhou Experiment Station for Comprehensive Development of Natural Resources in Red Earth Hilly Area, Yucheng Agriculture Ecological Station and Changbai Mountain Forest Ecology Station. These five ecosystem experimental stations are built by Chinese Academy of Sciences. The basic remote sensing data were M**O**DIS reflectivity production data. The daily air temperature and solar radiance data were obtained from China Meteorological Administration[1]. The surface measurement results were gotten from Chinese Ecosystem Research Network (CERN)[2]. The MODIS GPP production were download from MODIS website. The time of all these data are in 2003.

2.2Method

A light use efficiency model[3] was applied to get 8 days avenger GPP of five ecosystem experimental stations. The main formula is:

$$\mathrm{GPP} = \varepsilon_n \times \mathrm{FPAR} \times \mathrm{Q_{PAR}}$$

FPAR is defined as the fraction of photosynthetically active radiation absorbed by a plant canopy[4]. Normally it has correlativity with NDVI which is Normalized Difference Vegetation Index. In this paper a correlativity between MODIS bands and FPAR was used. $\mathrm{Q_{PAR}}$ is photosynthetic active radiation. ε_n is the function of maximal light use efficiency, air temperature and moisture index.

4.Results

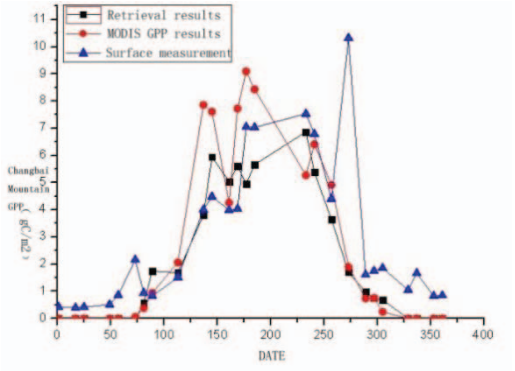
According to the method of upper mentioned, five ecosystem stations 8 days average GPP in 2003 are obtained. Though compared with MODIS GPP production and surface measurement results, the retrieval results have the same trends with other two kinds of Verification data. In July and August ,because of sufficient sunshine and rainfall, GPP are reached to maximum. In January and February, GPP are reduced to minimum. Just because temperature limitation function are set at 0 when the air temperature was lower than 0℃, the retrieval GPP results in these two months are even reduced to 0. This question still needed to be improved.

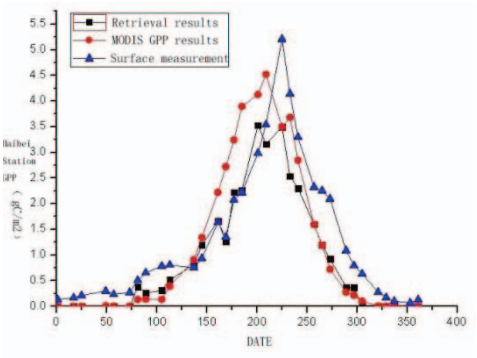
From the scatter diagram of Changbai Mountain station, the retrieval results are closed to the other two kinds of verification data. That mains that the parameters of Forest ecosystem are relatively suitable. But in Qianyanzhou

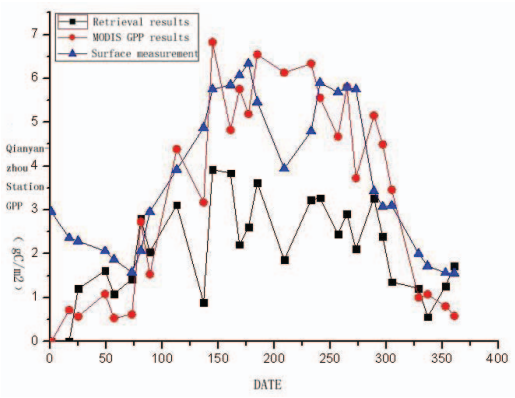
Station and Yucheng Station which are both agriculture ecosystem station the parameters are not very suitable. After adjusting one of these parameters, the better results can be gotten.

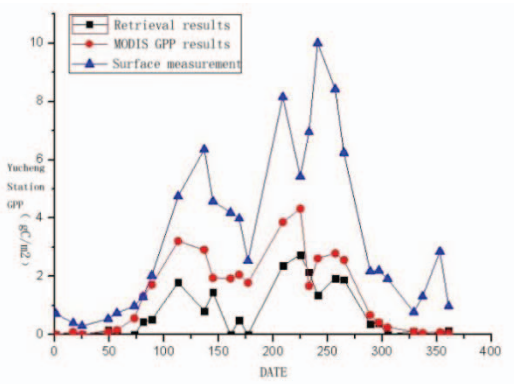
Even though Qianyanzhou station and Yucheng station are both agriculture ecosystem station, because of higher rainfall and air temperature GPP of Qianyanzhou Station are higher than Yucheng Station. Similarly, Haibei meadow ecosystem station and Inner Mongolia grassland ecosystem station have different GPP results because of different solar radiation.

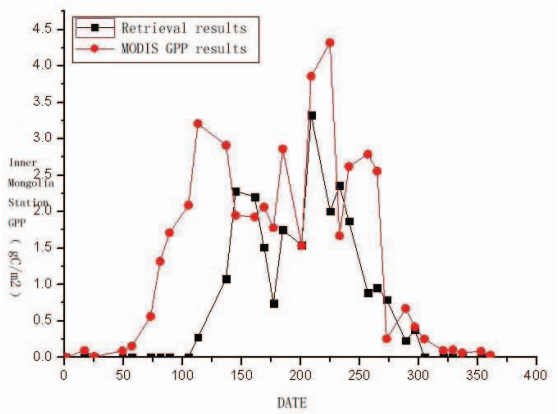
The following scatter diagrams are the compared results between three kinds of GPP data of five ecosystem stations in 2003.











4.References

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[2] http://www.cern.ac.cn

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