ESTIMATING LEAF AREA INDEX OF QINGHAI SPRUCE FOREST IN QILIAN MOUNTAIN USING QUICKBIRD SATELLITE DATA

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1. INTRODUCTION

Qinghai spruce (*Picea crassifolia*) is widely distributed in the Qilian Mountains, northwestern China. It plays a vital role not only in the water storage in the soil but also in reducing the peak flows during convective rain events. Besides, it also contributes to carbon sequestration and biodiversity. To understand Qinghai spruce's eco-hydrological functions, it is necessary to quantify canopy properties of the species. Leaf area index (LAI) is an important parameter to depict canopy properties. Our objective is to obtain spatial distribution of LAI based on QuickBird multispectral image in hope that we can provide a important parameter for the distributed ecohydrological models on small catchments.

2. MATERIAL AND METHOD

2.1. Study area

The study area is situated at Pailugou catchment (about 5 km^2)in Qilian mountains nature reserve (E100°17′, N38°24′), northwestern China. The elevation ranges from 2600-3800m. The climate is characterized cold and dry winters and cool and wet summers. The mean annual air temperature is 0.5℃. The mean annual precipitation is 368.0mm with 70% of precipitation falls between July and September. The types of vegetation are forest, forest

steppe, sub-alpine shrubby meadow. The forest dominated by Qinghai spruce (*Picea crassifolia*) distributes the north -face slope at 2400-3300m. The steppe is on south-face at the same elevation. The sub-alpine shrubby meadow covers the area with 3300-3800m.

2.2. Data collection

To investigate the LAI of Qinghai spruce, 51 sample points were selected in the study area in August 2008. LAI was measured at each point using two Li-Cor LAI-2000 instruments. One is in the forest, the other is outside. QuickBird multispectral image obtained in August 2008 was used to estimate many kinds of vegetation indexes (VIs).

2.3. Statistical models between LAI and VIs

Statistical models between LAI and VIs commonly used such as NDVI, RVI, ARVI, MSAVI and EVI were built. By validating, the optimal model was selected to simulated the spatial distribution of LAI in the study.

3. RESULTS AND DISCUSSION

Indexes (NDVI、RVI、ARVI、MSAVI、EVI、MCAVI) were calculated based on QuickBird multispectral image and extracted in each sampling point. The relationships between LAI measured and VIs extracted were built. We found the model ($LAI = 38.611NDVI - 18.32$)was the most accurate one with relation coefficient $R^2 = 0.766$ and RMSE=0.381. It was thus suggested that the model could be employed to get LAI distribution at both high spatial resolution and high accuracy (Fig. 1). The spatial distribution of LAI will be applied to drive the canopy interception model in further study in the study area.

4. CONCLUSIONS

This study estimated LAI distribution of Qinghai spruce in Pailugou watershed of Qilian Mountains based on QuickBird multispectral image and the field investigation. From the approach, conclusion can be drawn that statistical model between LAI and NDVI may be the best way to estimate LAI distribution in the study. But we found the accuracy of LAI was low at upper and lower lines of the forest because NDVI was affacted by understory vegetation.

5. REFERENCES

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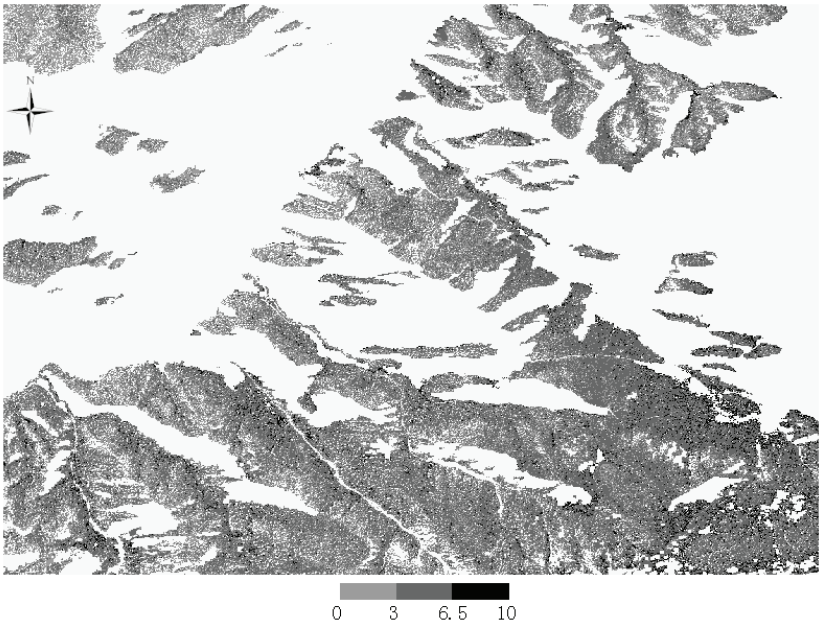

Fig.1 Spatial distribution of LAI of Qinghai spruce in the study area.