POTENTIAL ASSESSMENT OF LBI FOR FOREST CARBON SINK MEASUREMENT

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1. ABSTRACT

Quantitative assessment of forest carbon sequestration capacity is of great significance for maintaining sustainable forest development. LBI (LiDAR Biomass Index) has been proven to have the ability to achieve precise biomass estimation using airborne LiDAR. This research takes Pu'er City, Yunnan Province as the research area, combines with the airborne LiDAR data of 2018 and 2023 to explore the potential of LBI for measuring the carbon sink of Simao pine species.

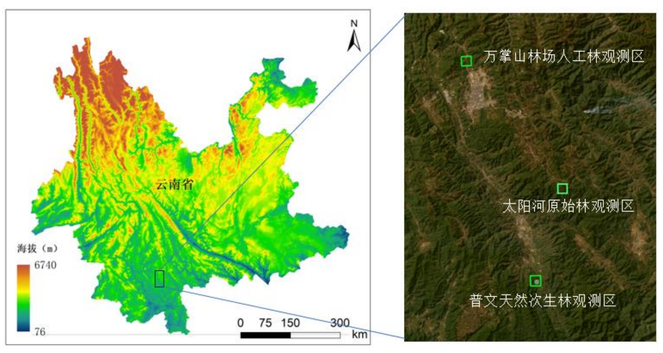
2. INTRODUCTION

Forests contain huge carbon sinks, which are important for ecological environment construction and sustainable development of forestry. The main aims of this research are below:

- ☐ Applicability evaluation of LBI for Simao Pine tree species;
- ☐ Universality evaluation of the AGB_LBI model of a certain year to other years;

3. STUDY AREA AND DATA

- Study area

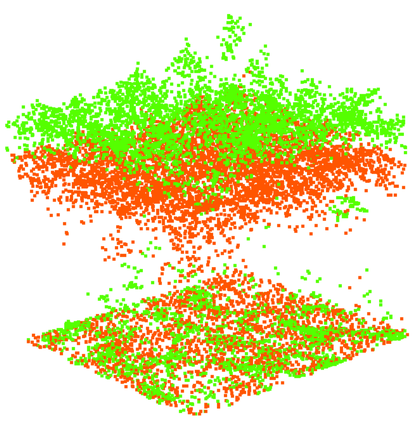


- ALS data

Acquired in October 2018 and January 2023 using a Riegl LMS-Q680i laser scanner. The average point density are all 12 pts/m^2.

- Field measurement data

35 and 26 sample plots in 2018 and 2023 were established, including 15 duplicate plots. The DBH, height and position of each individual tree in the plots were measured.



Green

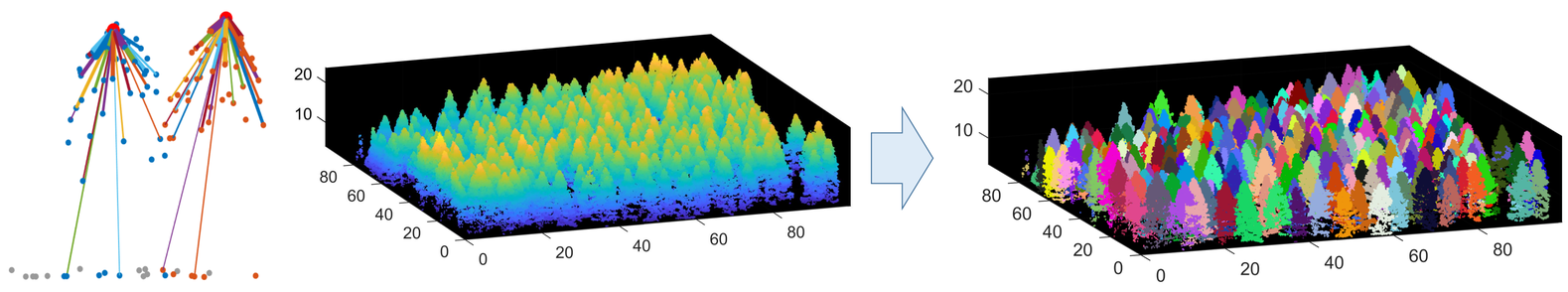
ALS data of 2023

Red

ALS data of 2018

4. METHODS

- Individual tree segmentation based on the NSC method



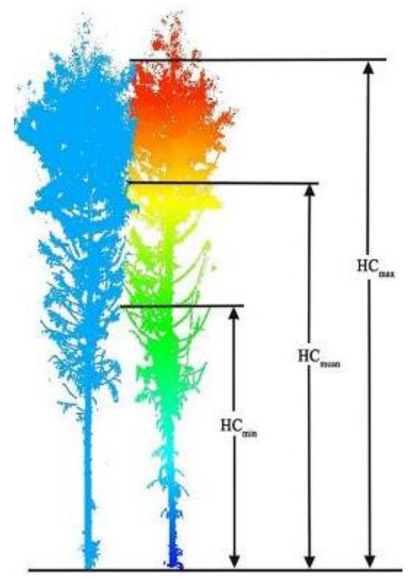
- LBI calculation of each individual tree

$$\mathrm{LBI} = \lim_{\Delta H \to 0} \sum_{H=H_B}^{H_T} U_L(H) \cdot A(H) \cdot \Delta H \cdot H$$

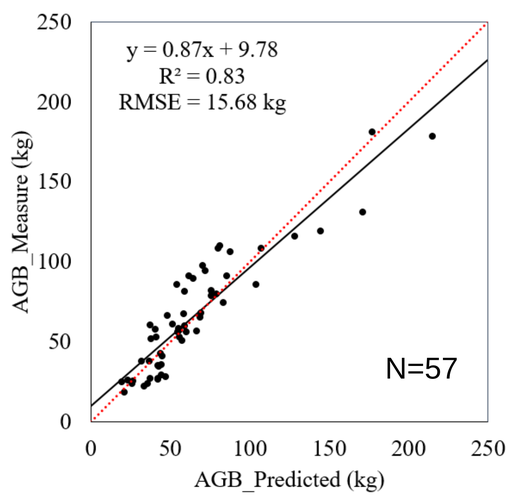
- Model regression based on the ALS data obtained in 2018 and limited number of sample trees

$$\mathrm{AGB} = k \cdot H_T^{\beta} \cdot LBI^{\frac{2\beta}{\alpha}}$$

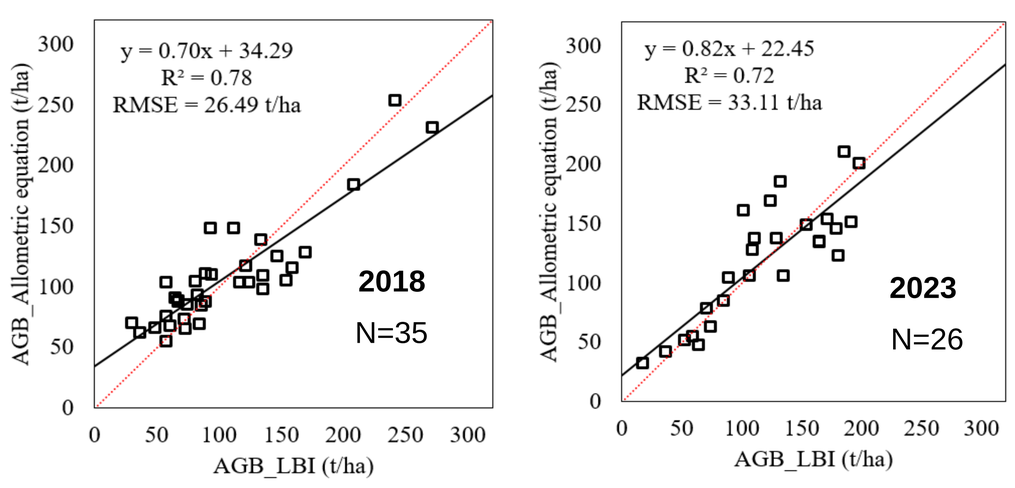
- Apply the AGB_LBI model to large scale ALS data obtained in 2018 and 2023



5. RESULTS



AGB_LBI Model



Plot level Verification result of 2018 and 2023

6. CONCLUSIONS

A relatively high-precision AGB_LBI model was established using 57 individual trees. The model of Simao pine species in a certain year is suitable for biomass calculation of other years, and high accuracies were achieved through using sample plots of different years for verification.

7. DISCUSSION

The universality of AGB_LBI models for the same tree species across different years makes this method have strong potential for carbon sink. It is necessary to verify its application capability on a larger scale and verify its availability within the whole forest farm using measured carbon storage change data.

8. MAJOR REFERENCES

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[2] Wang Q, Pang Y, Chen D, et al. Lidar biomass index: A novel solution for tree-level biomass estimation using 3D crown information. Forest Ecology and Management, 2021, 499: 119542.

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