

Monitoring Growth of Regenerated Saplings Through Stratifying Forest Overstory Using Airborne LiDAR Data

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1. ABSTRACT

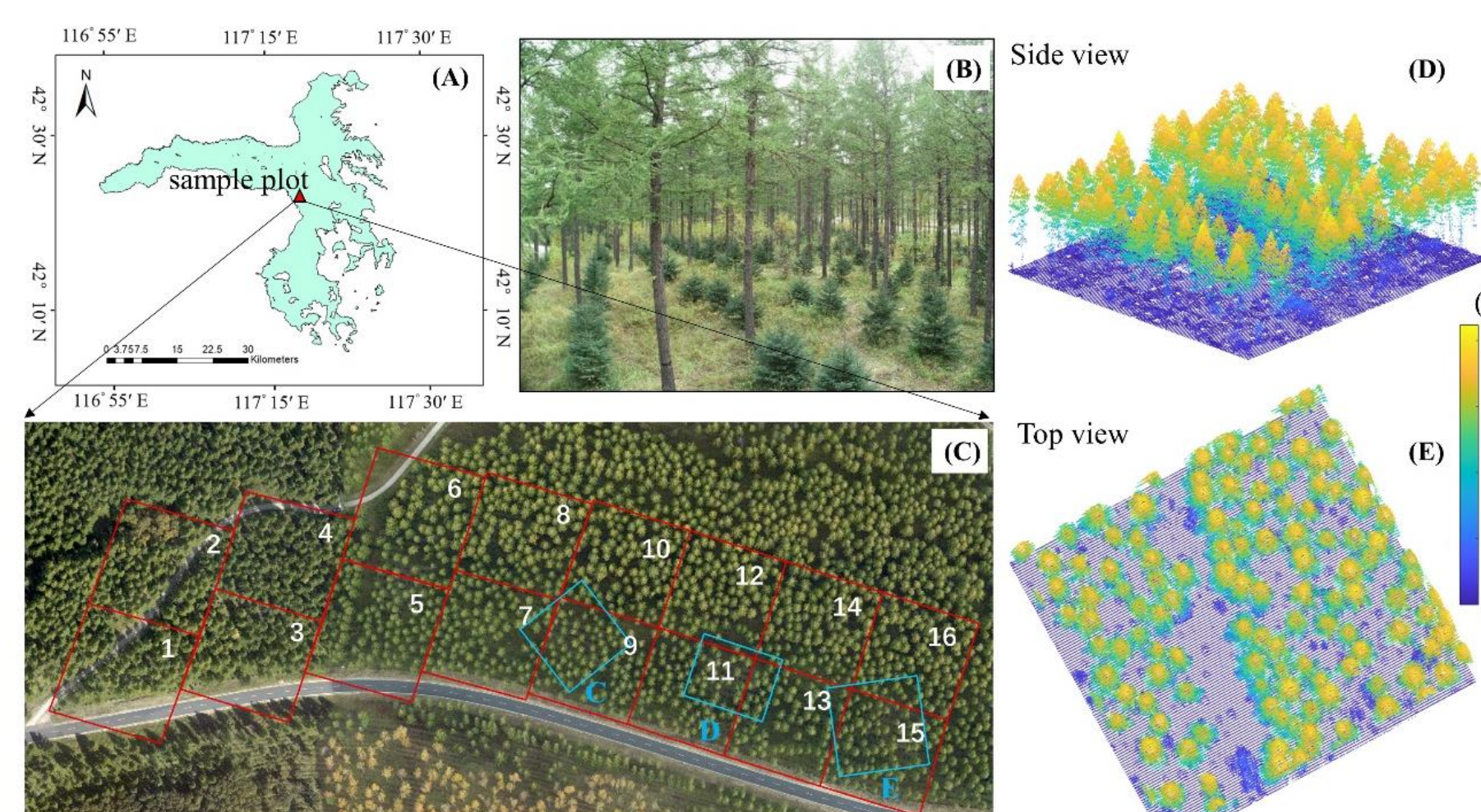
LiDAR can penetrate forest canopy to obtain 3D structural information from the top to the bottom of the forest, which provided a good data foundation for the extraction and segmentation of regenerated saplings under the large trees. This study proposed an automatic and improved method to detect the regenerated understory saplings in an experimental forest tree farm in North China based on the three-dimensional (3-D) structural information generated by LiDAR data.

2. INTRODUCTION

Regenerated saplings are crucial for an ecologically-resilient forest to maintain diverse and productive ecosystem functions. The method proposed in this study can automatically realize the segmentation of understory saplings, obtain their structure parameters such as tree height, and provide technical support for studying the growth status of saplings.

3. STUDY AREA AND DATA

● Study area



Study area and data

● ALS data

Acquired in September 2018 using a Riegl LMS-Q680i laser scanner. The average point density is 234 pts/m².

● TLS data

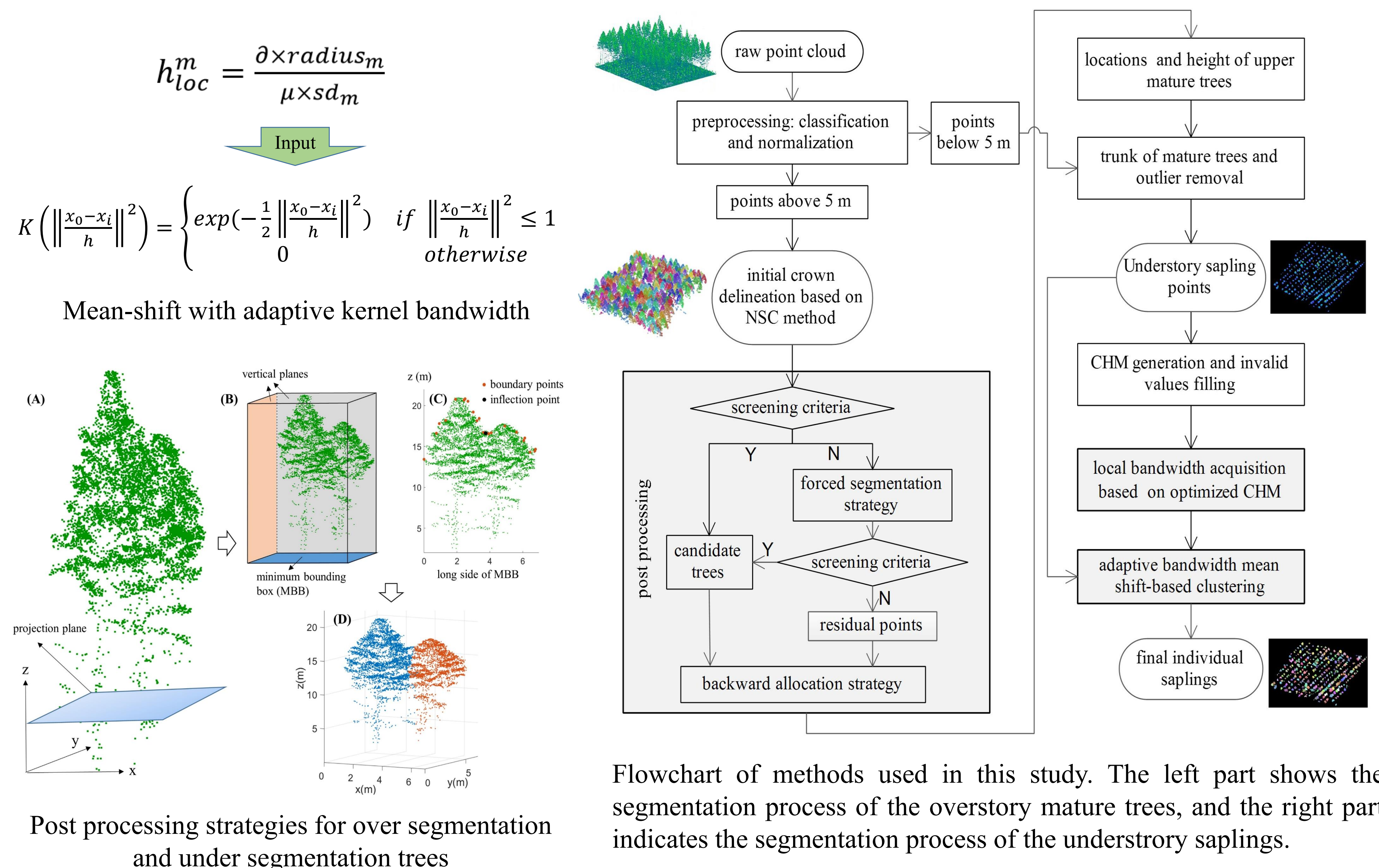
Acquired in September 2018 using Trimble TX8 3D laser scanner.

● Field measurement data

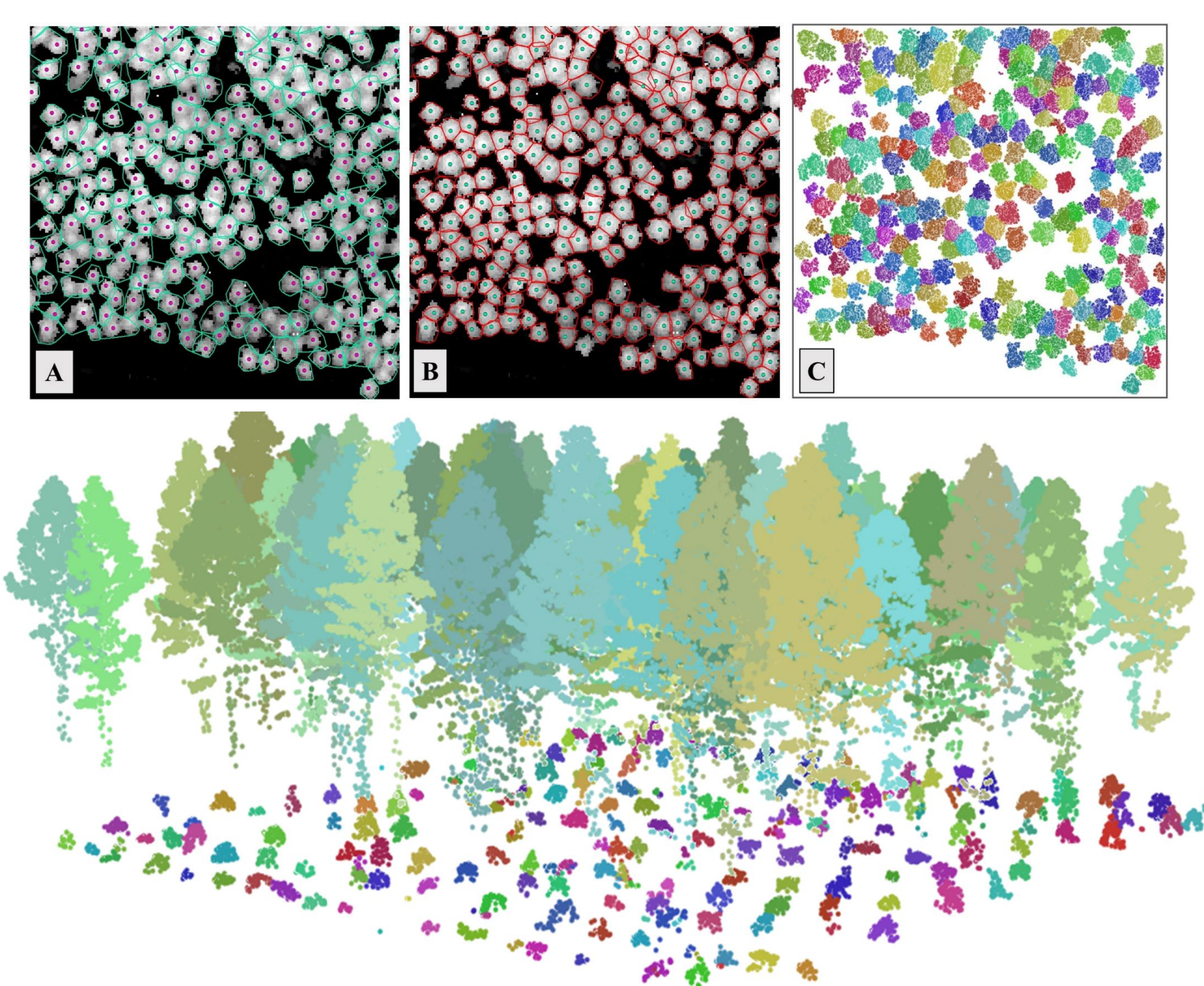
3963 spruce saplings planted at the lower layer of Larch in the sample plot with the total area of 4.69 ha were measured. Field work was conducted in August 2017. The sample plot was further divided into 15 subplots with the same dimensions of about 50 m×50 m and used to verify the proposed method.

4. METHODS

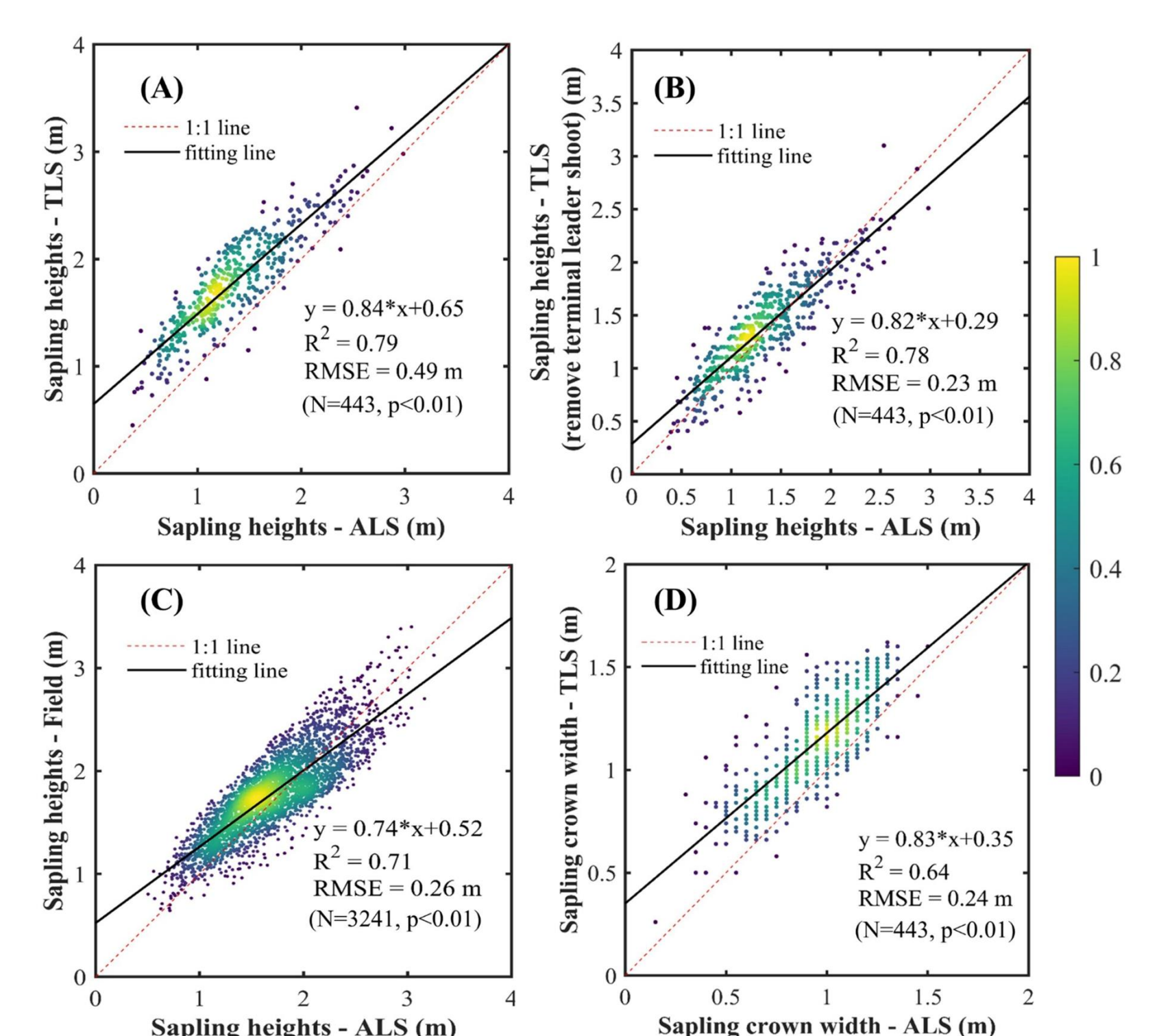
- A novel post-processing method for individual tree segmentation was developed, effectively eliminating the overstory larch canopy point clouds and trunk points mixed among spruce saplings.
- The understory saplings were segmented using an adaptive bandwidth mean shift-based clustering algorithm.



5. RESULTS



Detection results of saplings under upper mature trees



Parameter extraction accuracy

6. CONCLUSIONS

This study provides a foundation for increasing the capacity of forest carbon sequestration through regulating the dynamics of forest gaps to better utilizing light resources. Affected by the obstruction of mature trees in the upper layer, ALS has a certain degree of underestimation for the height and crown width of most saplings.

7. MAJOR REFERENCES

- [1] Du L and Pang Y. Identifying regenerated saplings by stratifying forest overstory using Airborne LiDAR Data. Plant Phenomics, 2024.
- [2] A. D. Kupferschmid, S. Zimmermann, and H. Bugmann. Browsing regime and growth response of naturally regenerated *Abies alba* saplings along light gradients. Forest Ecology and Management, 2013.