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TITLE: Estimating Mangrove Forest Volume Using Terrestrial Laser Scanning and UAV-Derived Structure-from-Motion

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ABSTRACT:

Mangroves provide a variety of ecosystem services, which can be related to their structural complexity and ability to store carbon in the above ground biomass (AGB). Quantifying AGB in mangroves has traditionally been conducted using destructive, time-consuming, and costly methods, however, Structure-from-Motion Multi-View Stereo (SfM-MVS) combined with unmanned aerial vehicle (UAV) imagery may provide an alternative. Here, we compared the ability of SfM-MVS with terrestrial laser scanning (TLS) to capture forest structure and volume in three mangrove sites of differing stand age and species composition. We describe forest structure in terms of point density, while forest volume is estimated as a proxy for AGB using the surface differencing method. In general, SfM-MVS poorly captured mangrove forest structure, but was efficient in capturing the canopy height for volume estimations. The differences in volume estimations between TLS and SfM-MVS were higher in the juvenile age site (42.95%) than the mixed (28.23%) or mature (12.72%) age sites, with a higher stem density affecting point capture in both methods. These results can be used to inform non-destructive, cost-effective, and timely assessments of forest structure or AGB in mangroves in the future.

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