Review of Terrestrial Aboveground Biomass Estimation using Remote Sensing

Jose Don De Alban[1], Sreekar Rachakonda[1], Stanley Tan Shi Xuan[1,2], Qiming Zheng[1], Yiwen Zeng[1,3], and Lian Pin Koh[1]

[1] Centre for Nature-based Climate Solutions, Department of Biological Sciences, Faculty of Science, National University of Singapore, 117546 Singapore

[2] Yale-NUS College, 138527 Singapore; [3] Princeton School of Public and International Affairs, Princeton University, Princeton, New Jersey, 08544 USA

@dondealban @NUSCNCS

dbsjdtda@nus.edu.sg

The rationale behind the study…

- Nature-based climate solutions can unlock ~2 billion tons carbon credits per year across the global tropics
- Remote sensing technology can increase transparency in aboveground biomass (AGB) carbon estimation
- However, little consensus on remote sensing datatypes and modelling algorithms used to accurately estimate AGB

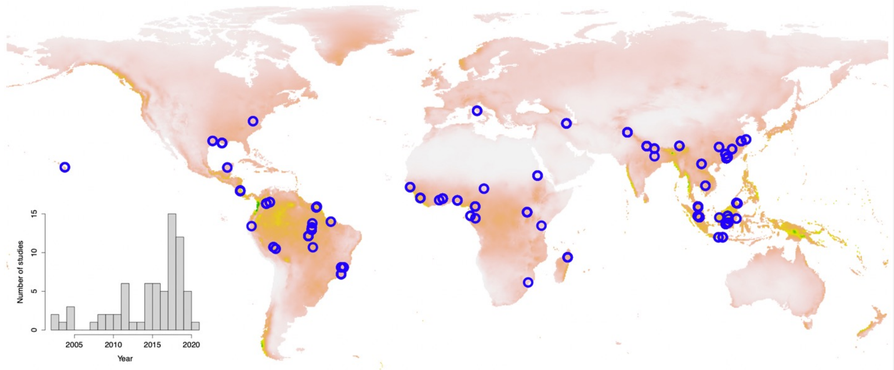
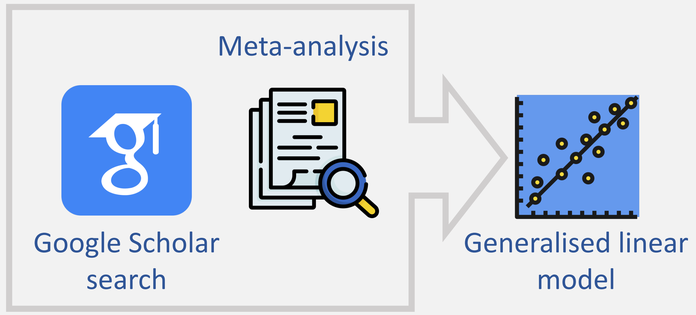


Fig. 1. Spatial and temporal distribution of studies used in our analysis. Background is a precipitation map. Dark green and light brown indicates high and low precipitation, respectively.

We wanted to know…

- Which remote sensing data types, modelling algorithms, and their combinations best estimated forest AGB?
- Did plot size influence AGB predictions?

We conducted the study by…



- Search terms: 'aboveground biomass carbon', 'tropical forest', 'remote sensing'
- Criteria: (i) developed models to predict forest AGB carbon
  (i) area of study within tropical/subtropical forests
  (iii) prediction model used remote sensing data
- Recorded accuracy of models (goodness-of-fit statistic, R^2)

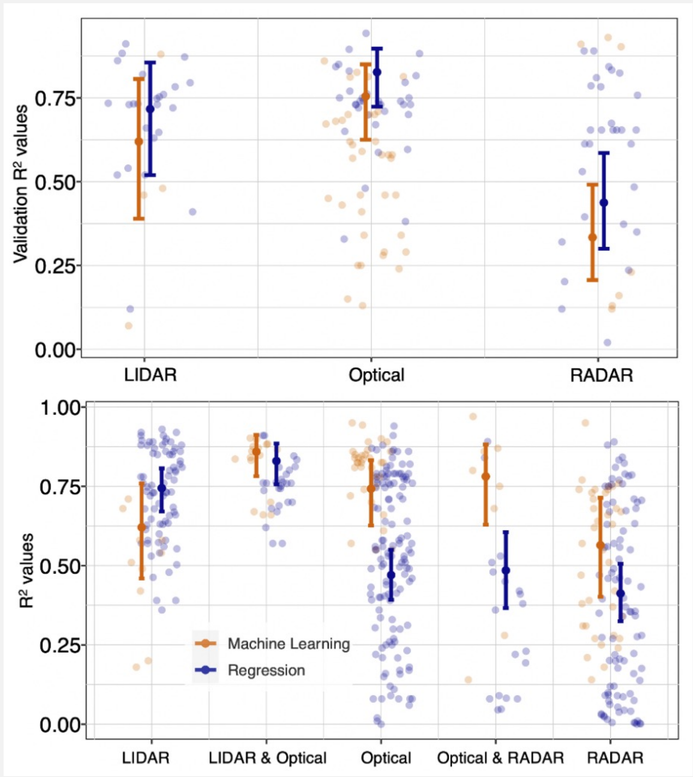


Fig 2. Effect of remote sensing datatypes and modelling algorithms on model performance, particularly model R^2 (bottom) and validation R^2 (top).

Our main findings were…

- Total of 95 studies (501 field sites) across tropical and subtropical forests globally **(Fig. 1)**
- Model R^2: 78 studies (448 field sites) **(Fig. 2)**
  - ✓ Highest model R^2 → ML algorithms with Optical+LIDAR, Optical+SAR, Optical datatypes
- Validation R^2: 36 studies (151 field sites)
  - ✓ Regression and ML algorithms had same R^2 values
  - ✓ Optical R^2 > SAR R^2, but Optical R^2 similar to LIDAR R^2
- Model performance (model R^2 and validation R^2) tended to improve with increase in plot size, but not statistically significant **(Fig. 3)**

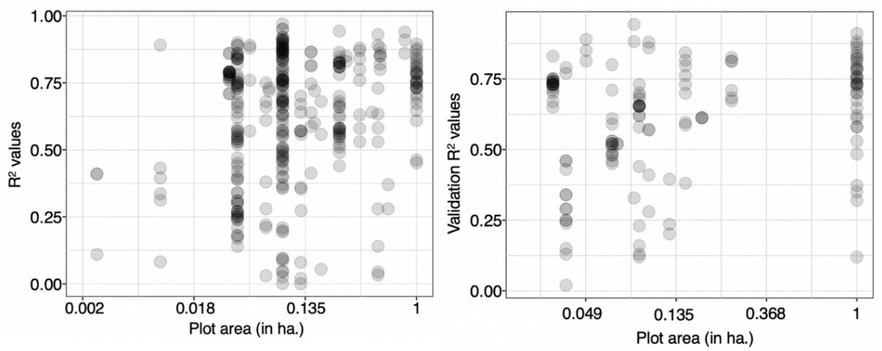


Fig 3. Effect of plot size on model performance, particularly model R^2 (left) and validation R^2 (right). We found no significant relationships.

The key takeaway…

Our findings provide insights for transparent, robust, and informed assessments of nature-based carbon projects for effective climate change mitigation, with genuine partnerships developed among all stakeholders

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