# Supplementary Materials for:

Comprehensive comparison of airborne and spaceborne SAR and LiDAR estimates of forest structure in the tallest mangrove forest on Earth

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**Figure S1:** Plot-level allometric models using the (black) Chave et al. 2014 and (red) Komiyama et al. (2005) equations.

**Table S1:** Model summary for maximum plot-level tree height to Chave et al. (2014) and Komiyama et al. (2005) biomass (see Figure S5).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Coefficients** | **Estimate** | **Std. Err** | **t-value** | **p-value** | **RMSE**  **(Mg ha-1)** |
| *Chave et al. 2014* |  | 8.4525 | 9.6629 | 0.875 | 0.39551 | 131.7 |
|  | 1.0870 | 0.3093 | 3.514 | 0.00313 |
|  |  |  |  |  |  |  |
| *Komiyama et al. 2005* |  | 19.4314 | 20.2064 | 0.962 | 0.3515 | 146.1 |
|  | 0.8287 | 0.2871 | 2.886 | 0.0113 |

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**Figure S2:** Comparison of plot-level biomass estimates from Komiyama et al. (2005) and Chave et al. (2014) allometry. Grey region is the standard error of the slope estimate. The primary source of variation between the two equations stems from the inclusion of height in the Chave allometry.

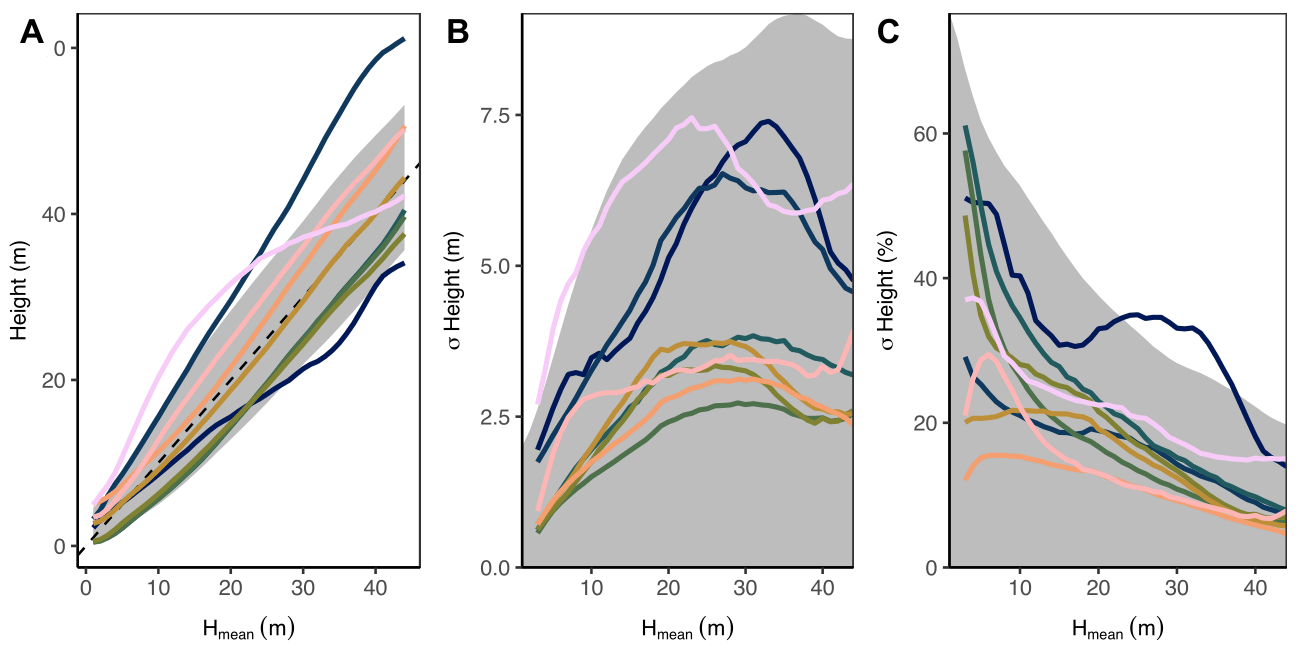
**Table S2:** ICESat-2 and GEDI TanDEM-X height calibration model and statistics.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ICESat-2 | | Coefficients | Estimate | Std. Err | t-value | p-value |
|  | 1.12005 | 0.12998 | 8.617 | <0.001 |
|  | 0.68158 | 0.01485 | 45.907 | <0.001 |
| **Residual standard error:** 1.988 on 391 degrees of freedom  **R-squared:** 0.8435  **F-statistic:** 2107 on 1 and 391 DF, p-value: <0.001 | | | | |
| GEDI | |  |  |  |  |  | | --- | --- | --- | --- | --- | | Coefficients | Estimate | Std. Err | t-value | p-value | |  | 4.815837 | 0.115274 | 41.78 | <0.001 | |  | 1.157313 | 0.005584 | 207.27 | <0.001 | | Residual standard error: 4.83 on 3482 degrees of freedom  R-squared: 0.925  F-statistic: 4.296e+04 on 1 and 3482 DF, p-value: <0.001 | | | | | | | | | | | |

Diagram

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**Figure S3:** Relationship between sitewide mean mangrove canopy height (*Hmean*) and (C) product heights minus *Hmean* and standard deviation (within a product (color) and across products (grey) from 9 remote sensing products represented as a percent of Hmean. Relative variability decreases with Hmean.



**A**

**B**

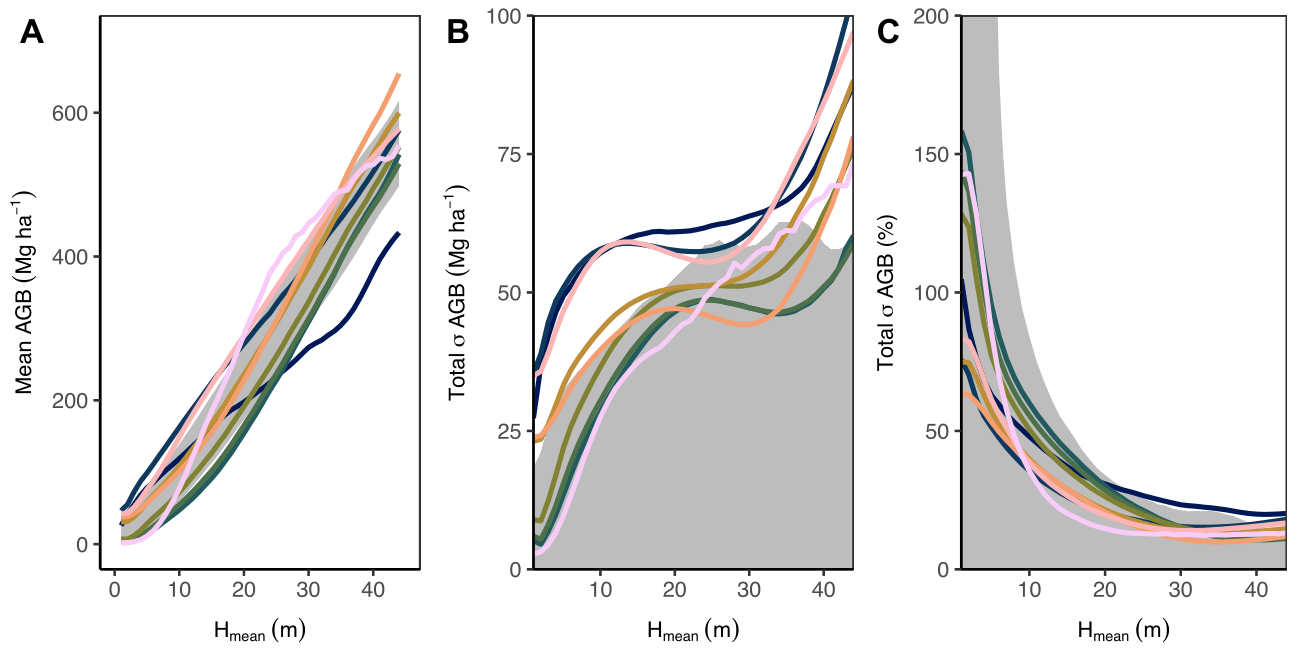
**C**

**Figure S4:** Relationship between sitewide mean mangrove canopy height (Hmean) and (A) product heights and (B) absolute and (C) relative standard deviation intra-sensor (color) and inter-sensor (shaded grey) heights from 9 remote sensing products. Intra- and inter-sensor height variability increases with Hmean, while the equivalent relative variation decreases with Hmean.

Diagram

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**Figure S5:** Relationship between AGBmean and product biomass (AGBproduct) minus AGBmean (residuals) as a percentage of AGBmean, with standard deviation (within product (color) and across all products (grey)) from 9 remote sensing products. AGB variability decreases with AGBmean.



**A**

**B**

**C**

**Figure S6:** Relationship between sitewide mean mangrove canopy height (Hmean) and (A) product heights and (B) absolute and (C) relative standard deviation intra-sensor (color) and inter-sensor (shaded grey) heights from 9 remote sensing products. Intra- and inter-sensor height variability increases with Hmean, while the equivalent relative variation decreases with Hmean.

**Chart

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**Figure S7:** Pixel-level comparison of local mean (across 9 products) height estimates (Hmean) and the [A] L-band and [B] P-band FSAR height products. The residual plots indicate an agreement in the [C] L-band and [D] P-band heights, becoming more negative above 35 m in Hmean.

**Chart

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**Figure S8:** Pixel-level comparison of local mean (across 9 products) aboveground biomass estimates (AGBmean) and the [A] L-band and [B] P-band FSAR height products. The residual plots indicate a slight positive deviation in the [C] L-band between 175-550 Mg ha-1, while [D] P-band heights closely match AGBmean throughout the range.