Supplementary Information for Gaui et al., in prep: **Biomass equations and carbon stock estimates for the southeastern Brazilian Atlantic Forest**

**Method non-destructive data collection**




**Figure S1 -** Non-destructive climbing method for tree measurements. (A): tree stem measurements with ladder; (B): tree stem measurements with climbing equipment; (C): tree crown measurements with climbing equipment; (D): adapted method with two measurers for large trees.

## Selection of the best models

To evaluate the model fits, we used graphical and statistical criteria, including the correlation coefficient (r); the relative standard error of the estimate (Syx%, Eq.2), which indicates estimate precision; the Akaike Information Criterion (AIC), which guides model selection based on information content; and graphical analysis of residuals.

## Local-Generic Model

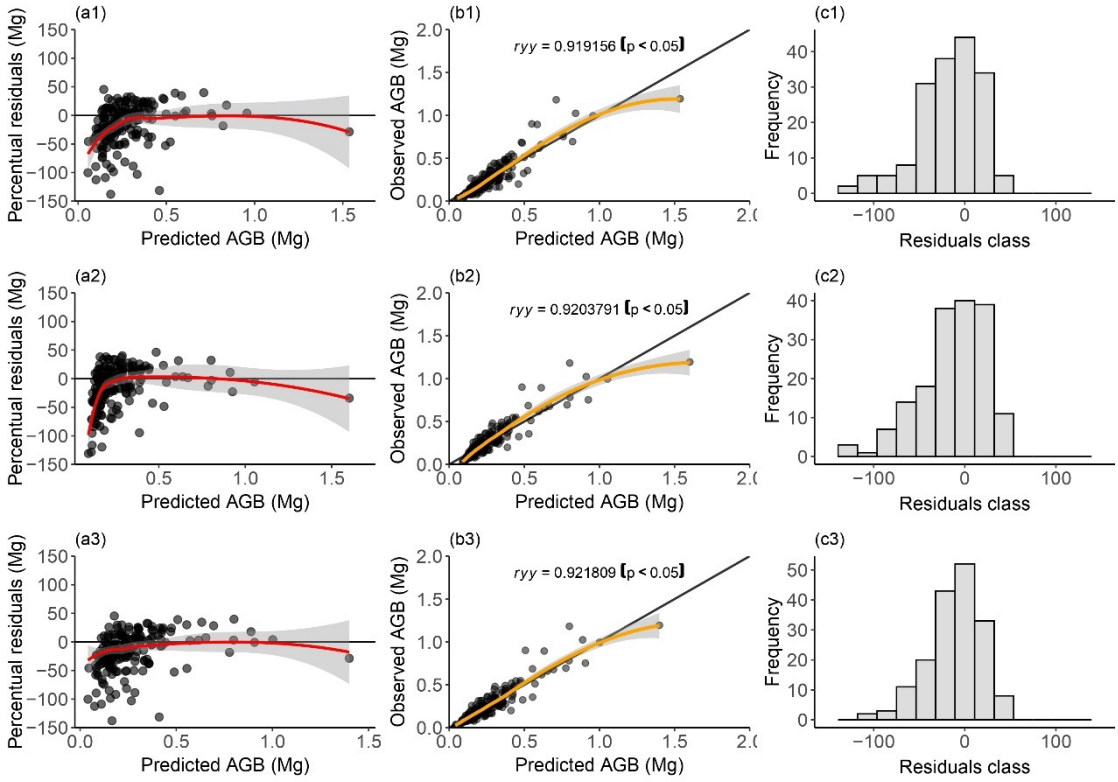



**Figure S2** - Graphical analysis of percentage residuals (a1, a2, a3), correlations between observed and predicted above-ground biomass values (b1, b2, b3), and frequency histogram of the relative errors (c1, c2, c3) produced by the models of Husch (a1, b1, c1), Spurr (a2, b2, c2), and Schumacher and Hall (a3, b3, c3) based on the total dataset to estimate the total above-ground biomass in the Atlantic Forest cover of Rio de Janeiro state, Brazil.

## Rainforest (RAF)

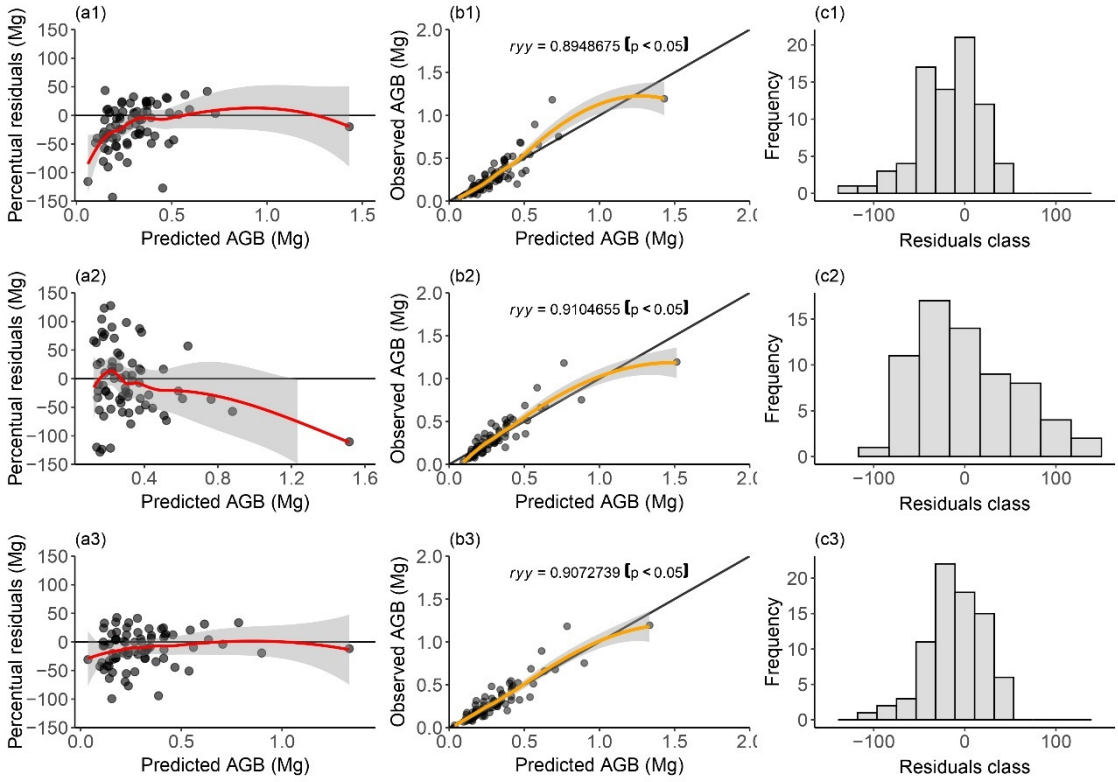



**Figure S3** - Graphical analysis of percentage residuals (a1, a2, a3), correlations between observed and predicted above-ground biomass values (b1, b2, b3), and frequency histogram of the relative errors (c1, c2, c3) produced by the models of Husch (a1, b1, c1), Spurr (a2, b2, c2), and Schumacher and Hall (a3, b3, c3) to estimate the total above-ground biomass of Rainforests in Rio de Janeiro state, Brazil.

## Semideciduous Forest (SF)

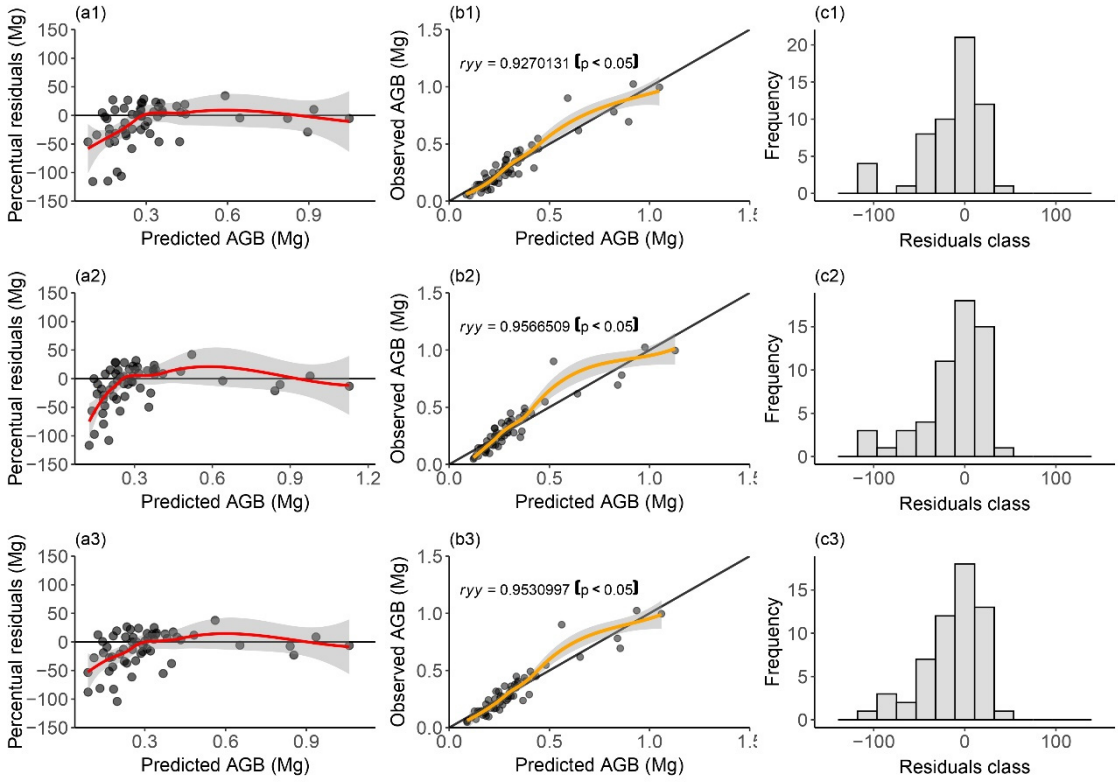



**Figure S4** - Graphical analysis of percentage residuals (a1, a2, a3), correlations between observed and predicted above-ground biomass values (b1, b2, b3), and frequency histogram of the relative errors (c1, c2, c3) produced by the models of Husch (a1, b1, c1), Spurr (a2, b2, c2), and Schumacher and Hall (a3, b3, c3) to estimate the total above-ground biomass of Semideciduous Forests in Rio de Janeiro state, Brazil.

## Restinga Forest (RF)

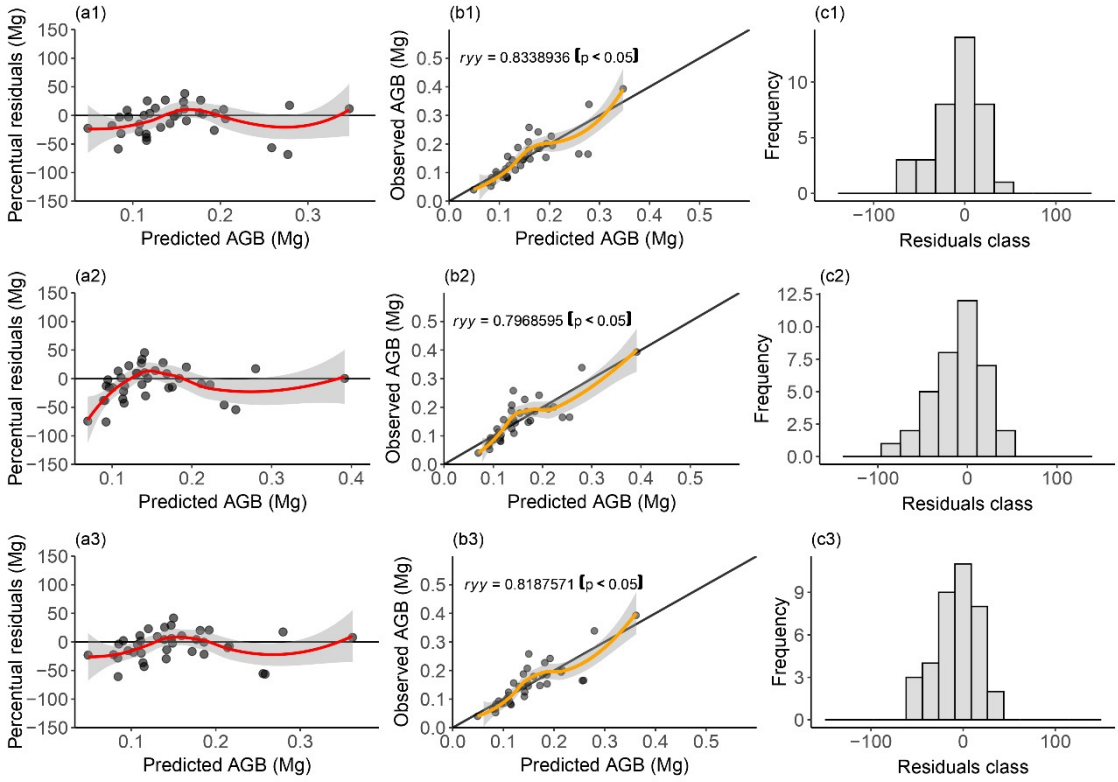



**Figure S5** - Graphical analysis of percentage residuals (a1, a2, a3), correlations between observed and predicted above-ground biomass values (b1, b2, b3), and frequency histogram of the relative errors (c1, c2, c3) produced by the models of Husch (a1, b1, c1), Spurr (a2, b2, c2), and Schumacher and Hall (a3, b3, c3) to estimate the total above-ground biomass of Restinga Forests in Rio de Janeiro state, Brazil.

**Equivalence test**

To compare the estimates yielded by the three types of equation (forest-specific, local-generic, and pantropical) with the observed biomass values ($\alpha = 0.01$), we applied the equivalence test (regression-based TOST using bootstrap). This test has been widely used to compare means or similarities between estimates and actual observations (Robinson et al., 2005; Weiskittel et al., 2011). It stands out as the most appropriate method for evaluating a model (Robinson et al., 2005) or verifying statistical equivalence between estimates of a variable obtained through two different assessment methods.

**Equivalence test at the individual level**

This test was applied considering the biomass of each tree measured in the field, including 172 individuals in total (78 trees in RAF, 57 in SF, and 37 in RF). The results of the hypothesis tests applied indicate that there are no significant differences (p-value > 0.01) between the values estimates with the forest-specific and the local-generic equations. However, the estimates generated by the pantropical equation differ significantly from the field-measured values and the estimates generated by the forest-specific and local-generic equations.

Table S1. Results for equivalence test (regression-based TOST using bootstrap) for comparing means or similarities between field-measured biomass and the estimates produced by the forest-specific, local-generic, and pantropical equations. The analyses were based on biomass samples taken from 172 trees measured on-site.

| Treatment | Parameter | Confidence Interval | Similarity Region | Dissimilarity |
|---|---|---|---|---|
| *Specific vs. Observed* | Intercept | 0.260537 ± 0.2831768 | 0.2059699 ± 0.3432831 | Reject |
| | Slope | 0.9330647 ± 1.1539732 | 0.75±1.25 | Reject |
| *Generic vs. Observed* | Intercept | 0.2594806 ± 0.2838207 | 0.2058951 ± 0.3431585 | Reject |
| | Slope | 0.9241963 ± 1.1703845 | 0.75±1.25 | Reject |
| *Pantropical vs. Observed* | Intercept | 0.2636891 ± 0.2805474 | 0.2666154 ± 0.4443589 | Not Reject |
| | Slope | 0.6085321 ± 0.7191988 | 0.75±1.25 | Not Reject |
| *Specific vs. Generic* | Intercept | 0.2716771 ± 0.2780460 | 0.2058951 ± 0.3431585 | Reject |
| | Slope | 0.9740086 ± 1.0377375 | 0.75±1.25 | Reject |
| *Specific vs. Pantropical* | Intercept | 0.2682132 ± 0.2817292 | 0.2666154 ± 0.4443589 | Reject |

| | | | | |
|---|---|---|---|---|
| | Slope | 0.5516215 ± 0.6498555 | 0.75±1.25 | Not Reject |
| *Generic vs. Pantropical* | Intercept | 0.2682235 ± 0.2813898 | 0.2666154 ± 0.4443589 | Reject |
| | Slope | 0.5459625 ± 0.6400245 | 0.75±1.25 | Not Reject |

**Equivalence test at the plot level**

This test was applied considering the biomass stock obtained with the forest-specific, local-generic, and pantropical equations. For this, we used the field-sampled data obtained from 153 forest inventory plots (68 in RAF, 63 in SF, and 22 in RF) and 25,367 individuals (12,161 in DOS, 9,305 in SF, and 3,901 in RF). The hypothesis tests applied indicated no significant differences (p-value > 0.01) between the values estimated by the forest-specific and local-generic equations. However, the estimates produced with the pantropical equation differed significantly from the estimates generated by the forest-specific and local-generic equations.

Table S2. Results for equivalence test (regression-based TOST using bootstrap) to compare means or similarities between the estimates generated by the forest-specific, local-generic, and pantropical equations. The analyses were based on field-measured biomass samples from 185 plots.

| Treatment | Parameter | Confidence Interval | Similarity Region | Dissimilarity |
|---|---|---|---|---|
| *Specific vs. Pantropical* | Intercept | 20.63281 ± 22.43141 | 21.29896 ± 35.49826 | Not Reject |
| | Slope | 0.5435444 ± 0.6021719 | 0.75±1.25 | Not Reject |
| *Generic vs. Pantropical* | Intercept | 20.94659 ± 22.34415 | 21.29896 ± 35.49826 | Not Reject |
| | Slope | 0.6110745 ± 0.6739731 | 0.75±1.25 | Not Reject |
| *Specific vs. Generic* | Intercept | 20.86283 ± 22.15626 | 16.21703 ± 27.02838 | Reject |
| | Slope | 0.8653608 ± 0.9138352 | 0.75±1.25 | Reject |

Table S3. Summary of the statistical results for biomass samples taken from 172 trees measured on site.

| Forest type | AGB min | ABG max | AGB average | CV | SD |
|---|---|---|---|---|---|
| FOD | 0.03 | 1.19 | 0.30 | 76.30 | 0.23 |
| FES | 0.05 | 1.02 | 0.31 | 70.19 | 0.22 |
| RES | 0.04 | 0.39 | 0.15 | 50.10 | 0.08 |