**Ecology**
**Appendix S1.**

# Characterizing tree trait variance over spatiotemporal scales

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## Section S1: Supplementary methods

*Study site* – The mean annual rainfall in the 16-ha plot is ~3,548 mm, elevation ranges from 333 to 428 m a.s.l. and soils are formed from volcaniclastic rock (Ewel and Whitmore 1973). The forest is dominated by the palm, *Prestoea accuminata* (Arecaceae) and the tabonuco tree, *Dacryodes excelsa* (Burseraceae), other common species include *Manilkara bidentata* (Sapotaceae) and *Casearia arborea* (Salicaceae).

*Seedling plots* – In 1999, 150 2 × 1m seedling plots were established at the center of each 20 × 20m sub-quadrant along six 500 m long transects (spaced 60 m apart) within the 16-ha plot (Thompson et al. 2002) (Appendix S1: Figure S1). In 2004, 63 additional plots were established between the second and the fifth transects (Comita et al. 2009) (Appendix S1: Figure S1). Within each plot, all seedlings > 10 cm in height were tagged, measured for maximum height, and identified. The 213 seedling plots were monitored annually from 2007 to 2016, during which 11,597 seedlings from 78 tree species were monitored. We did not use the census information between 1999 and 2006 because not all 213 plots were monitored over this period and the censuses were not annual and Taylor et al. (1988) suggested that consistency in sampling increases the reliability of Taylor's Power Law.

*Functional traits* – The traits were collected from adult trees using 25 samples per species for measuring SLA and 10 samples per species for measuring WSG (Uriarte et al. 2010, Swenson et al. 2012). We averaged trait values at the species level. While SLA information is also available from seedlings, we opted not to use seedling traits because of the lower sample size (46 species of seedlings compared to 78 species of adults used in this study). Also, SLA of seedlings and adults are significantly correlated in this forest (Umaña et al. 2016). Trait mean and variances are presented in Table S1 in Appendix S1.

These three traits represent major life history axes encompassing physiological, dispersal, structural and competitive processes important in determining assembly of tropical forest communities in a hurricane-disturbed region. It is known that disturbance plays a key role in generating diversity of ecological strategies (Grime 1977) where early successional stages are typically dominated by pioneer species with lower WSG, high SLA and low SM, while later stages are dominated by species with the opposite traits.

## References

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**Table S1.** Ranges (min and max) of trait means and variances, plot distance, and years for SLA: specific leaf area ($cm^2\ g^{-1}$); SM: seed mass (g); WSG: wood specific gravity ($cm^3\ g^{-1}$).

| Traits | Mean | Variance | Distance (m) | Year |
|---|---|---|---|---|
| | 95.14 | 4.21 | 0.0 | 2007 |
| SLA | 496.44 | 303400.90 | 566.0 | 2016 |
| | 0.0007 | 0.00002 | 0.0 | 2007 |
| SM | 13.52 | 405.54 | 566.0 | 2016 |
| | 0.26 | 0.0000000003 | 0.0 | 2007 |
| WSG | 0.82 | 0.15 | 566.0 | 2016 |

**Table S2.** Coefficient estimates, p-values and 95% confidence intervals for slopes of Taylor's Power Law across various spatial and temporal scales for SLA: specific leaf area ($cm^2\ g^{-1}$); SM: seed mass (g); WSG: wood specific gravity ($cm^3\ g^{-1}$).

| Scale type | Grain | Term | Estimate | Std. Error | Statistic | P-value | CI 2.5% | CI 97.5% |
|---|---|---|---|---|---|---|---|---|
| Spatial | 1 | log(mean.sla) | 6.25 | 0.20 | 30.62 | <0.001 | 5.84 | 6.65 |
| Spatial | 2 | log(mean.sla) | 6.82 | 0.10 | 67.52 | <0.001 | 6.62 | 7.02 |
| Spatial | 3 | log(mean.sla) | 8.56 | 0.08 | 102.19 | <0.001 | 8.39 | 8.72 |
| Spatial | 4 | log(mean.sla) | 9.45 | 0.07 | 133.01 | <0.001 | 9.31 | 9.59 |
| Spatial | 5 | log(mean.sla) | 10.33 | 0.06 | 167.27 | <0.001 | 10.21 | 10.45 |
| Spatial | 6 | log(mean.sla) | 11.08 | 0.06 | 191.16 | <0.001 | 10.97 | 11.19 |
| Spatial | 7 | log(mean.sla) | 11.52 | 0.06 | 190.25 | <0.001 | 11.40 | 11.64 |
| Spatial | 8 | log(mean.sla) | 11.96 | 0.06 | 204.38 | <0.001 | 11.85 | 12.08 |
| Spatial | 9 | log(mean.sla) | 12.18 | 0.06 | 197.99 | <0.001 | 12.06 | 12.30 |
| Spatial | 10 | log(mean.sla) | 12.28 | 0.08 | 150.49 | <0.001 | 12.12 | 12.44 |
| Spatial | 1 | log(mean.sm) | 3.29 | 0.10 | 32.11 | <0.001 | 3.09 | 3.50 |
| Spatial | 2 | log(mean.sm) | 1.53 | 0.02 | 70.41 | <0.001 | 1.49 | 1.57 |
| Spatial | 3 | log(mean.sm) | 1.34 | 0.02 | 79.84 | <0.001 | 1.31 | 1.38 |
| Spatial | 4 | log(mean.sm) | 1.20 | 0.01 | 82.55 | <0.001 | 1.17 | 1.22 |
| Spatial | 5 | log(mean.sm) | 0.97 | 0.01 | 120.91 | <0.001 | 0.95 | 0.99 |
| Spatial | 6 | log(mean.sm) | 0.97 | 0.01 | 130.97 | <0.001 | 0.95 | 0.98 |
| Spatial | 7 | log(mean.sm) | 0.97 | 0.01 | 122.91 | <0.001 | 0.96 | 0.99 |
| Spatial | 8 | log(mean.sm) | 0.93 | 0.01 | 108.63 | <0.001 | 0.91 | 0.95 |
| Spatial | 9 | log(mean.sm) | 0.91 | 0.01 | 78.31 | <0.001 | 0.89 | 0.93 |
| Spatial | 10 | log(mean.sm) | 0.92 | 0.02 | 44.86 | <0.001 | 0.88 | 0.96 |
| Spatial | 1 | log(mean.wsg) | -0.09 | 0.17 | -0.54 | 0.59 | -0.43 | 0.24 |
| Spatial | 2 | log(mean.wsg) | -1.18 | 0.11 | -10.95 | <0.001 | -1.39 | -0.97 |
| Spatial | 3 | log(mean.wsg) | -0.54 | 0.09 | -6.02 | <0.001 | -0.71 | -0.36 |
| Spatial | 4 | log(mean.wsg) | -0.85 | 0.08 | -10.88 | <0.001 | -1.00 | -0.70 |
| Spatial | 5 | log(mean.wsg) | -1.21 | 0.08 | -15.07 | <0.001 | -1.36 | -1.05 |
| Spatial | 6 | log(mean.wsg) | -1.66 | 0.07 | -22.65 | <0.001 | -1.81 | -1.52 |
| Spatial | 7 | log(mean.wsg) | -2.36 | 0.08 | -31.23 | <0.001 | -2.51 | -2.21 |
| Spatial | 8 | log(mean.wsg) | -2.12 | 0.08 | -27.07 | <0.001 | -2.27 | -1.97 |
| Spatial | 9 | log(mean.wsg) | -2.75 | 0.09 | -30.01 | <0.001 | -2.93 | -2.57 |
| Spatial | 10 | log(mean.wsg) | -3.11 | 0.14 | -22.62 | <0.001 | -3.38 | -2.84 |
| Temporal | 1 | log(mean.SLA) | 3.96 | 0.09 | 44.04 | <0.001 | 3.79 | 4.14 |
| Temporal | 2 | log(mean.SLA) | 3.79 | 0.09 | 40.65 | <0.001 | 3.61 | 3.98 |
| Temporal | 3 | log(mean.SLA) | 3.76 | 0.10 | 38.22 | <0.001 | 3.57 | 3.96 |
| Temporal | 4 | log(mean.SLA) | 3.78 | 0.10 | 37.32 | <0.001 | 3.58 | 3.98 |
| Temporal | 5 | log(mean.SLA) | 3.81 | 0.10 | 36.53 | <0.001 | 3.61 | 4.02 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Temporal | 6 | log(mean.SLA) | 3.86 | 0.11 | 34.37 | <0.001 | 3.64 | 4.08 |
| Temporal | 7 | log(mean.SLA) | 3.89 | 0.12 | 31.11 | <0.001 | 3.64 | 4.13 |
| Temporal | 8 | log(mean.SLA) | 3.94 | 0.14 | 27.44 | <0.001 | 3.66 | 4.23 |
| Temporal | 9 | log(mean.SLA) | 3.94 | 0.18 | 22.38 | <0.001 | 3.59 | 4.28 |
| Temporal | 10 | log(mean.SLA) | 3.90 | 0.25 | 15.86 | <0.001 | 3.42 | 4.39 |
| Temporal | 1 | log(mean.sm) | 2.16 | 0.03 | 85.46 | <0.001 | 2.11 | 2.21 |
| Temporal | 2 | log(mean.sm) | 2.24 | 0.03 | 83.96 | <0.001 | 2.18 | 2.29 |
| Temporal | 3 | log(mean.sm) | 2.29 | 0.03 | 79.63 | <0.001 | 2.23 | 2.34 |
| Temporal | 4 | log(mean.sm) | 2.34 | 0.03 | 76.07 | <0.001 | 2.28 | 2.40 |
| Temporal | 5 | log(mean.sm) | 2.38 | 0.03 | 70.07 | <0.001 | 2.32 | 2.45 |
| Temporal | 6 | log(mean.sm) | 2.42 | 0.04 | 63.87 | <0.001 | 2.35 | 2.50 |
| Temporal | 7 | log(mean.sm) | 2.46 | 0.04 | 56.42 | <0.001 | 2.37 | 2.55 |
| Temporal | 8 | log(mean.sm) | 2.51 | 0.05 | 48.15 | <0.001 | 2.41 | 2.61 |
| Temporal | 9 | log(mean.sm) | 2.56 | 0.07 | 38.72 | <0.001 | 2.43 | 2.69 |
| Temporal | 10 | log(mean.sm) | 2.58 | 0.10 | 26.95 | <0.001 | 2.40 | 2.77 |
| Temporal | 1 | log(mean.wsg) | 0.41 | 0.17 | 2.40 | 0.02 | 0.08 | 0.75 |
| Temporal | 2 | log(mean.wsg) | 0.78 | 0.12 | 6.66 | <0.001 | 0.55 | 1.01 |
| Temporal | 3 | log(mean.wsg) | 0.78 | 0.12 | 6.60 | <0.001 | 0.55 | 1.01 |
| Temporal | 4 | log(mean.wsg) | 0.92 | 0.11 | 8.47 | <0.001 | 0.71 | 1.14 |
| Temporal | 5 | log(mean.wsg) | 0.96 | 0.11 | 8.72 | <0.001 | 0.74 | 1.18 |
| Temporal | 6 | log(mean.wsg) | 0.78 | 0.11 | 7.15 | <0.001 | 0.56 | 0.99 |
| Temporal | 7 | log(mean.wsg) | 0.74 | 0.11 | 6.66 | <0.001 | 0.52 | 0.96 |
| Temporal | 8 | log(mean.wsg) | 0.72 | 0.13 | 5.65 | <0.001 | 0.47 | 0.97 |
| Temporal | 9 | log(mean.wsg) | 0.66 | 0.15 | 4.37 | <0.001 | 0.36 | 0.95 |
| Temporal | 10 | log(mean.wsg) | 0.64 | 0.21 | 3.08 | <0.001 | 0.23 | 1.04 |

**Table S3.** Pearson coefficients and p-values for correlations between slopes of Taylor's Power Law and spatial and temporal scales for SLA: specific leaf area ($cm^2\ g^{-1}$); SM: seed mass (g); WSG: wood specific gravity ($cm^3\ g^{-1}$).

| Scale type | Trait | r | P-value |
|---|---|---|---|
| Spatial | SLA | 0.96 | <0.001 |
| Spatial | SM | -0.71 | 0.02 |
| Spatial | WSG | -0.95 | <0.001 |
| Temporal | SLA | 0.44 | 0.2 |
| Temporal | SM | 0.99 | <0.001 |
| Temporal | WSG | 0.008 | 0.98 |

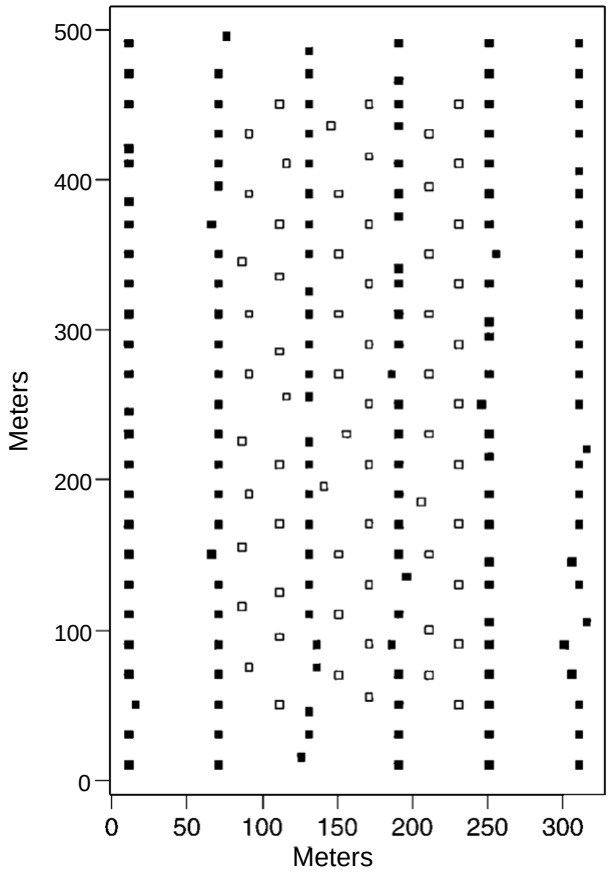


**Figure S1.** Location of 213 (2×1m) seedling plots within the 16-ha permanent plot in Puerto Rico. Filled squares indicate the location of the initial 150 plots established in 1999. The unfilled squares indicate the location of the additional 63 plots established in 2004.

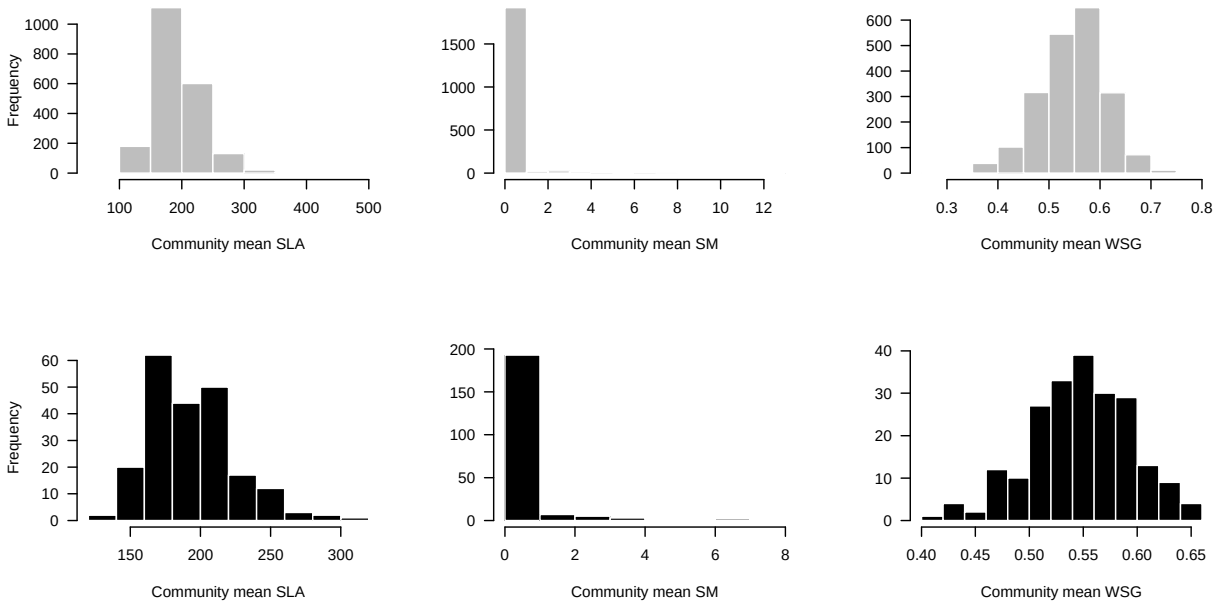


**Figure S2.** Histograms of trait distributions across 213 plots for two temporal grains: 1 year (top row) and 10 years (bottom row). SLA: specific leaf area ($cm^2\ g^{-1}$); SM: seed mass (g); WSG: wood specific gravity ($cm^3\ g^{-1}$).