## Supporting Information

Additional Supporting Information may be found in the online version of this article:

**Data S1.** Figures.
**Data S2.** Description of the study sites.
**Data S3.** Details about the database construction.
**Data S4.** Illustration of the goodness of fit at each of the 58 study sites. The full dataset is plotted in the background (black). The foreground points and regression line represent the best-fit regression for local datasets.
**Figure S1.** Distribution of the 58 study sites in environmental space of altitude, mean annual temperature, mean annual evapotranspiration (ET, mm $yr^{-1}$), mean annual rainfall, and temperature seasonality (TS). The gray shades in the background represent the range of observed variation in currently forested areas in the tropical belt. Red dots indicate Latin American sites, green African sites, and blue Southeast Asian and Australian sites.
**Figure S2.** Among-site relationship of the individual coefficient of variation to bioclimatic variables (TS: temperature seasonality; CWD: climatic water deficit) across study sites, for Model 4. Each point represents the individual coefficient of variation CV(*j*) of a study site *j*, as inferred from Model 4. Point color and size are as in Fig. 3.
**Figure S3.** Among-site relationship of the site-level bias with bioclimatic variables (TS: temperature seasonality; CWD: climatic water deficit) for Model 4. Each point represents the Bias(*j*) for site *j* as inferred from Model 4. Point color and size are as in Fig. 3.
**Figure S4.** Among-site relationship of the form factor (ratio AGB $/\rho D^2 H$ with bioclimatic variables (TS: temperature seasonality; CWD: climatic water deficit). Each point represents the mean form factor of a study site (equivalent to the fitted parameter of Model 5). Correlation tests were performed on each dataset. In panel (a) $P = 0.09$ (Bartlett test); in panels (b) to (d), $P < 10^{-3}$, $P = 0.08$, $P < 10^{-3}$ (Spearman correlation). Point color and size are as in Fig. 3.
**Figure S5.** Forward selection for bioclimatic variables in Eqn (3). The first selected variable is TS (temperature seasonality), and including it results in a decline of the residual standard error ($\sigma'$, noted RSE in the ordinate axis) from 0.430 to 0.292. The second selected variable is CWD (climatic water deficit), and including it results in a decline of the RSE from 0.292 to 0.272. The third selected variable is PS (precipitation seasonality), and including it results in a further decline of the RSE from 0.272 to 0.243. Additional environmental variables induced comparatively very little further decline in RSE (a gain of 0.022).
**Figure S6.** Comparison between the pantropical allometric AGB Model 7 and a model in which Feldpausch *et al.* (2012) regional diameter–height equations were used. (a) Individual coefficient of variation at each site for both types of allometries. (b) Bias at each site for both types of allometries. Point color and size are as in Fig. 3. The outlying sites are labeled.
**Table S1.** Study sites and their characteristics.
**Table S2.** Description of the variables included in the dataset ($n = 4004$).

SUPPLEMENTARY MATERIAL

*SM1. Figures*

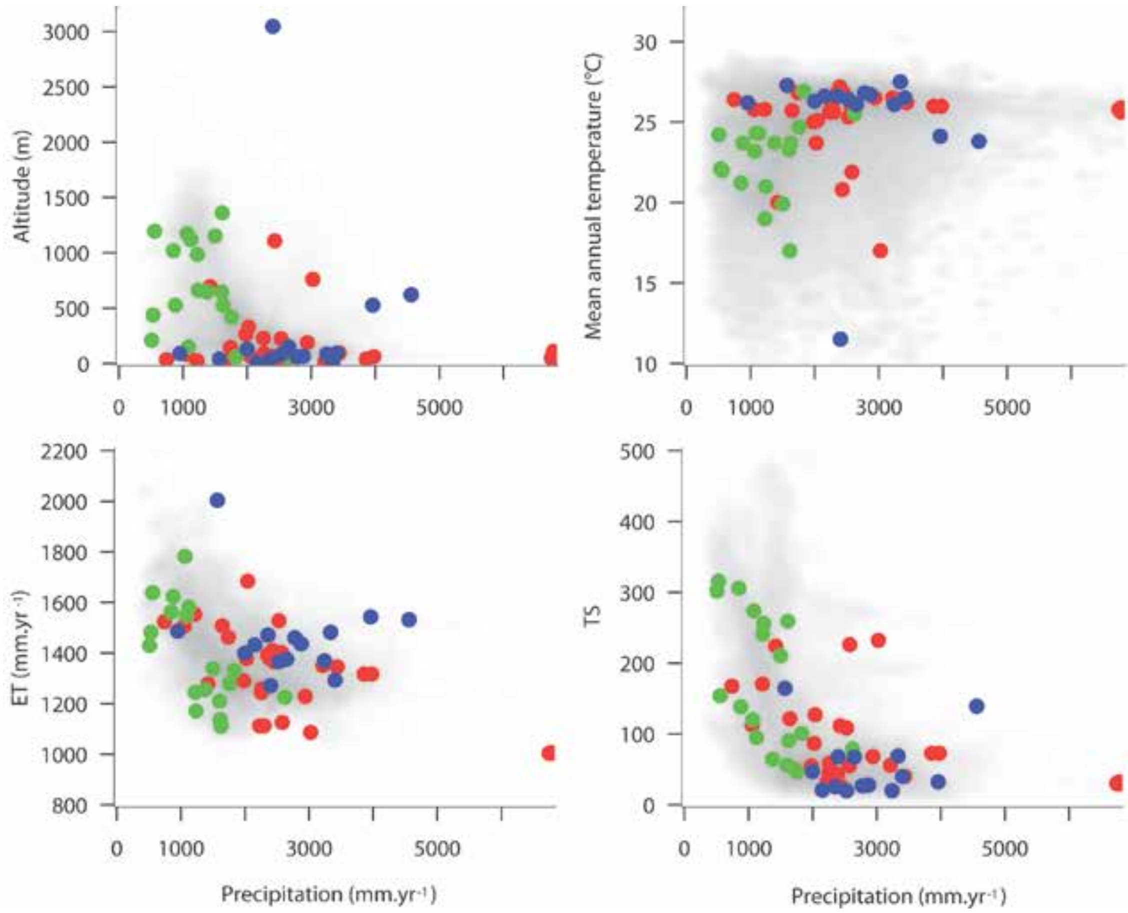


Figure S1. Distribution of the 58 study sites in environmental space of altitude, mean annual temperature, mean annual evapotranspiration (ET, mm $yr^{-1}$), mean annual rainfall, and temperature seasonality (TS). The grey shades in the background represent the range of observed variation in currently forested areas in the tropical belt. Red dots indicate Latin American sites, green African sites, and blue South-East Asian and Australian sites.

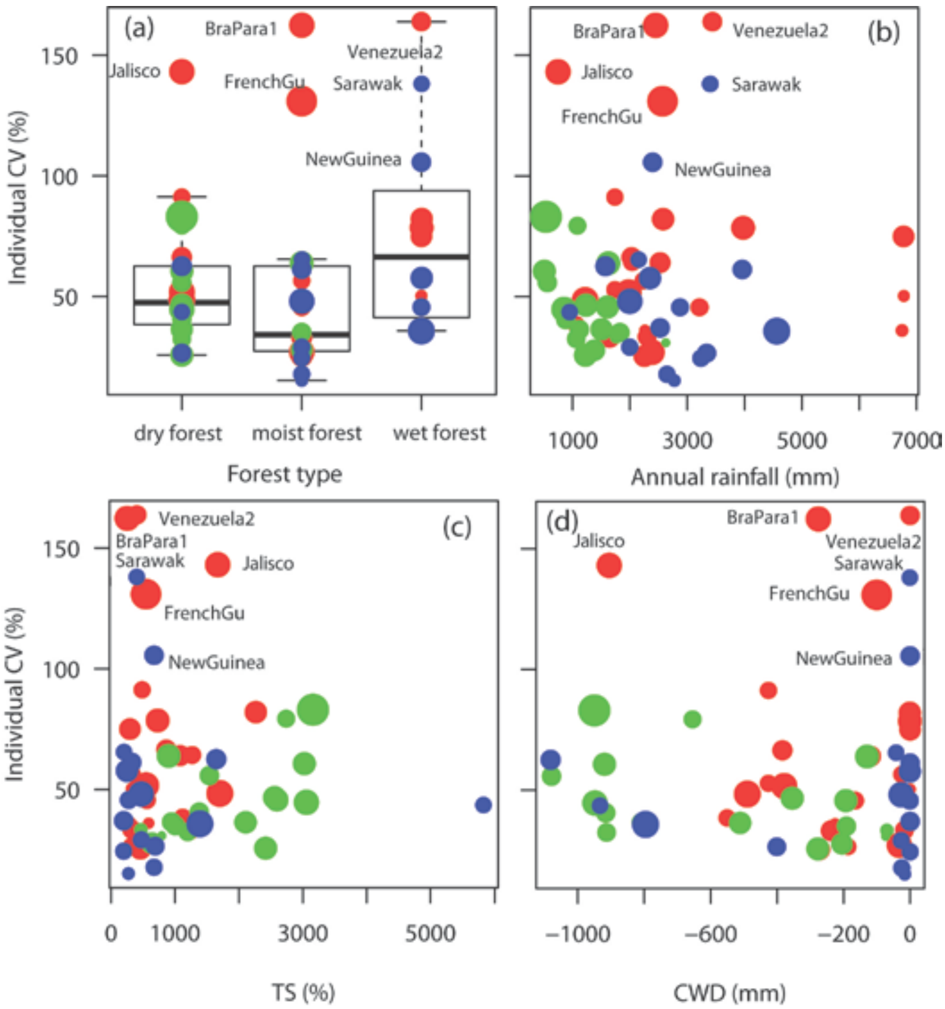


Figure S2. Among-site relationship of the individual coefficient of variation to bioclimatic variables (TS: temperature seasonality; CWD: climatic water deficit) across study sites, for Model 4. Each point represents the individual coefficient of variation CV(*j*) of a study site *j*, as inferred from Model 4. Point color and size are as in Fig. 3.

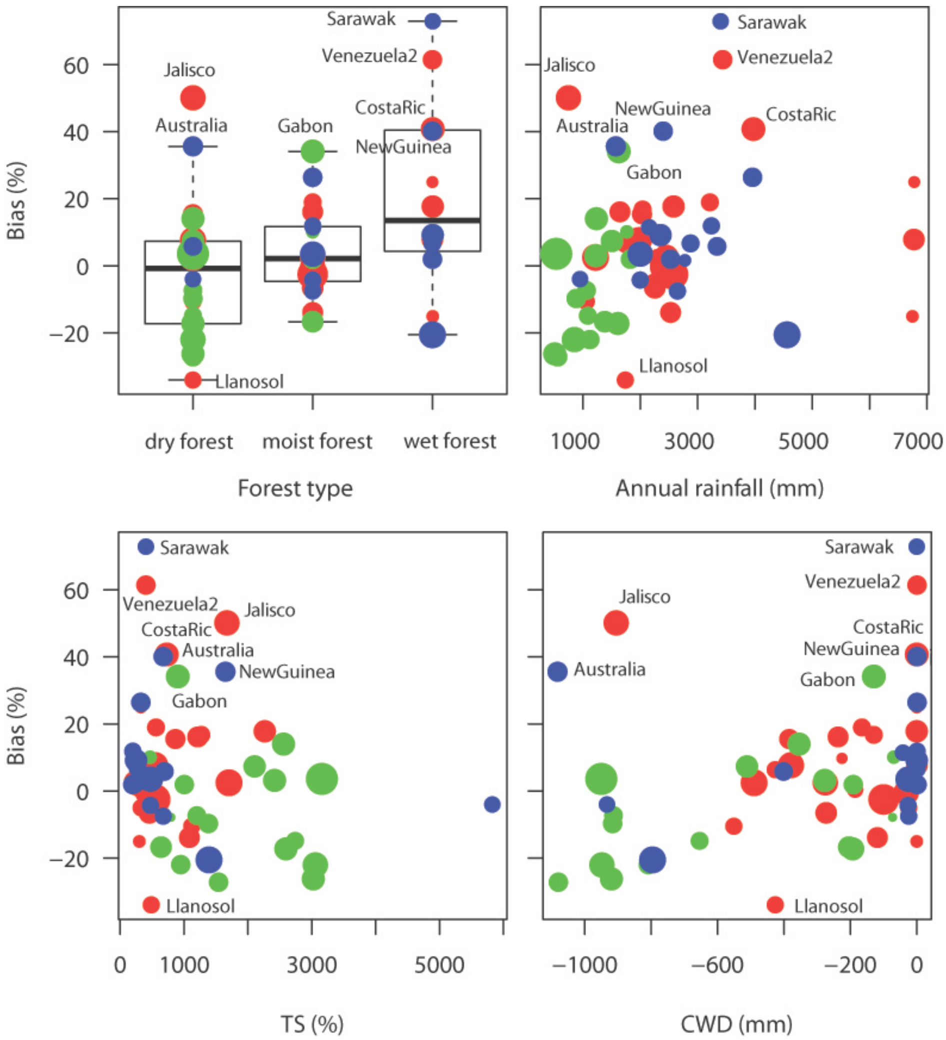


Figure S3. Among-site relationship of the site-level bias with bioclimatic variables (TS: temperature seasonality; CWD: climatic water deficit) for Model 4. Each point represents the Bias(*j*) for site *j* as inferred from Model 4. Point color and size are as in Fig. 3.

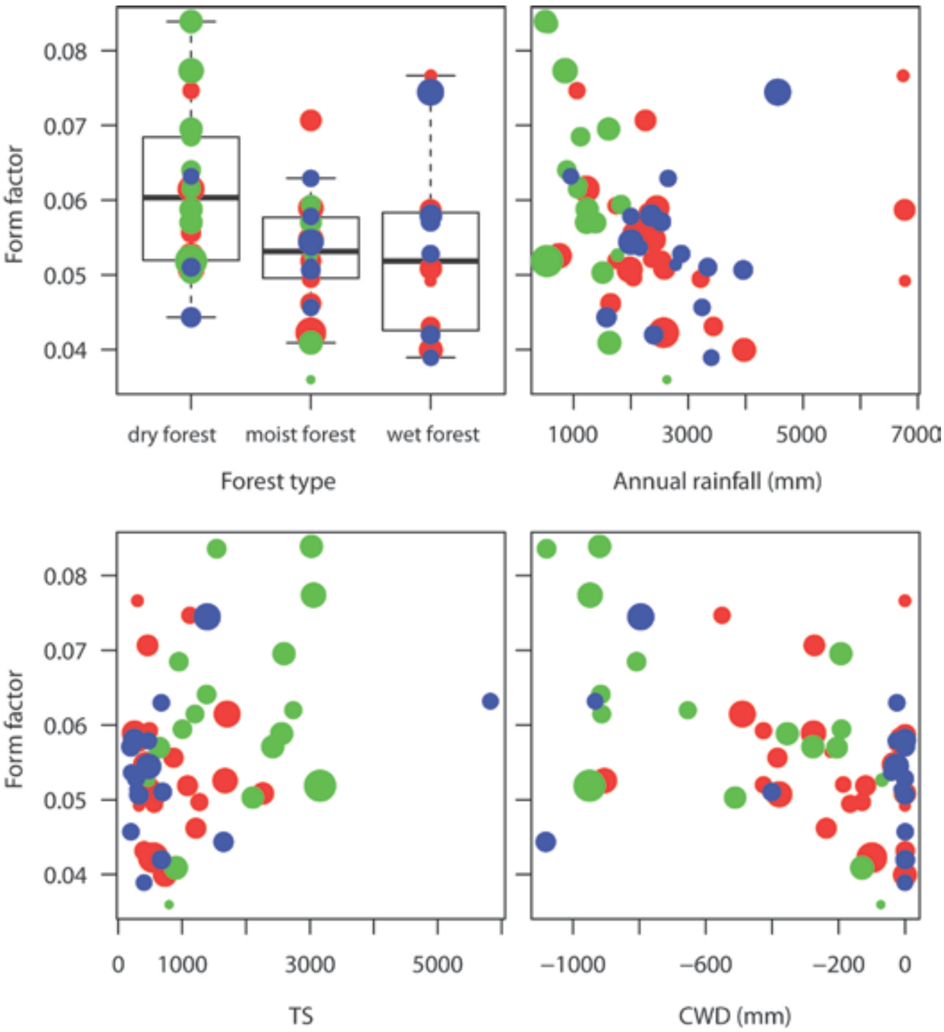


Figure S4. Among-site relationship of the form factor (ratio $AGB/\rho D^2 H$) with bioclimatic variables (TS: temperature seasonality; CWD: climatic water deficit). Each point represents the mean form factor of a study site (equivalent to the fitted parameter of Model 5). Correlation tests were performed on each dataset. In panel (a) p=0.09 (Bartlett test); in panels (b) to (d), $p<10^{-3}$, p=0.08, $p<10^{-3}$ (Spearman correlation). Point color and size are as in Fig. 3.

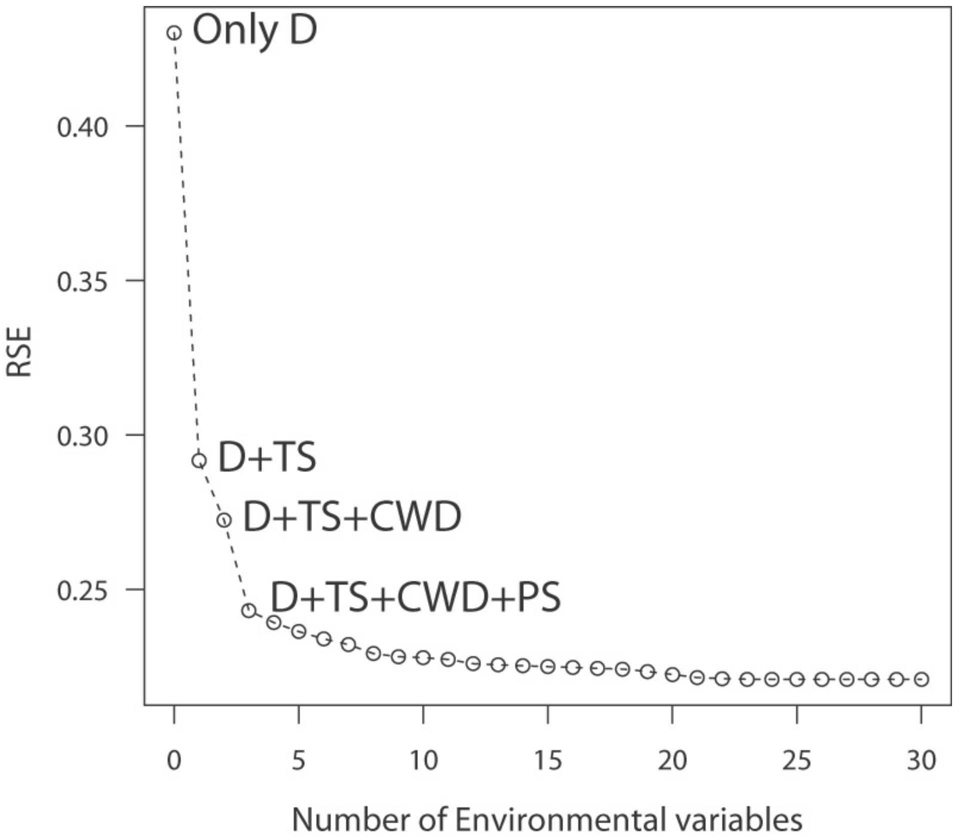


Figure S5. Forward selection for bioclimatic variables in Equation (3). The first selected variable is TS (temperature seasonality), and including it results in a decline of the residual standard error (σ’, noted RSE in the ordinate axis) from 0.430 to 0.292. The second selected variable is CWD (climatic water deficit), and including it results in a decline of the RSE from 0.292 to 0.272. The third selected variable is PS (precipitation seasonality), and including it results in a further decline of the RSE from 0.272 to 0.243. Additional environmental variables induced comparatively very little further decline in RSE (a gain of 0.022).

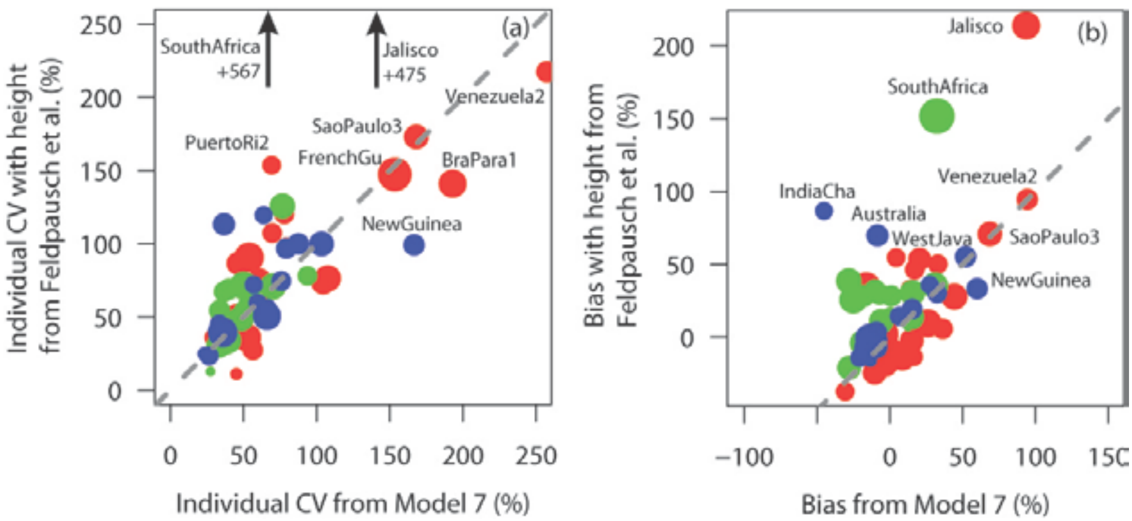


Figure S6. Comparison between the pantropical allometric AGB Model 7 and a model in which Feldpausch *et al.* (2012) regional diameter-height equations were used. (a) Individual coefficient of variation at each site for both types of allometries. (b) Bias at each site for both types of allometries. Point color and size are as in Fig. 3. The outlying sites are labeled.

*SM2. Description of the study sites.*

Table S1. Study sites and their characteristics.

| Locality | No of trees | Available in 2005 | Lat. (°N) | Long. (°E) | Locality | Forest type | Successional type | Mean annual temperature (°C) | Temp. Season-ality | Mean Annual Precip. (mm/yr) | Precip. Season-ality (%) | Altitude (m asl) | Evapo-transpiration (mm/yr) | Dry months | CWD (mm/yr) | Ref |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Australia | 46 | YES | -12.48 | 131.05 | Darwin, Northern Territory, Australia | dry forest | old growth | 273 | 1670 | 1547 | 104 | 39 | 2004 | 8 | -1075 | [1] |
| BraMan2 | 123 | YES | -2.5 | -60.17 | Manaus, Amazonas, Brazil | moist forest | secondary | 272 | 431 | 2358 | 33 | 64 | 1378 | 3 | -39 | [2] |
| BraPara1 | 127 | YES | -2.5 | -48.13 | Tomé Açu, Para, Brazil | moist forest | old growth | 268 | 259 | 2439 | 70 | 37 | 1366 | 6 | -286 | [3] |
| BraPara3 | 21 | YES | -1.37 | -48.28 | Belem, Para, Brazil | moist forest | secondary | 267 | 312 | 2377 | 54 | 22 | 1393 | 4 | -172 | [4] |
| BraRond | 8 | YES | -8.75 | -63.38 | Samuel Reservoir, Rondonia, Brazil | moist forest | old growth | 260 | 589 | 2258 | 63 | 91 | 1259 | 4 | -227 | [5] |
| Cambodia | 34 | YES | 10.93 | 103.4 | Thma Sa (formerly Cheko), Cambodia | dry forest | old growth | 275 | 690 | 3339 | 86 | 14 | 1481 | 6 | -402 | [6] |
| Cameroon | 5 | NO | 2.67 | 10 | Campo Ma'an, Cameroon | moist forest | old growth | 255 | 781 | 2611 | 59 | 53 | 1226 | 3 | -71 | [7] |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cameroon 3 | 59 | NO | 3.94 | 14.81 | Mindourou 2, South-west Cameroon | moist forest | old growth | 236 | 625 | 1380 | 47 | 647 | 1256 | 6 | -202 | [8] |
| CentralAfric | 12 | NO | 0.76 | 24.46 | Yangambi, Democratic Republic of Congo | moist forest | old growth | 248 | 480 | 1759 | 29 | 419 | 1281 | 2 | -70 | [9] |
| Colombia C1 | 60 | NO | 4.77 | -77.18 | Upland forest, departamento del Choco, Colombia | wet forest | old growth | 257 | 287 | 6753 | 21 | 107 | 1007 | 0 | 0 | [10] |
| Colombia G1 | 36 | NO | 1.64 | -78.84 | Swamp forest, departamento de Narino, Colombia | moist forest | old growth | 256 | 330 | 2333 | 46 | 14 | 1113 | 2 | -7 | [10] |
| Colombia G2 | 10 | NO | 4.71 | -77.18 | Swamp forest, departamento del Choco, Colombia | wet forest | old growth | 258 | 300 | 6737 | 21 | 50 | 1004 | 0 | 0 | [10] |
| Colombia M1 | 24 | NO | 1.64 | -78.89 | Mangrove forest, departamento de Narino, Colombia | moist forest | old growth | 256 | 331 | 2243 | 46 | 13 | 1113 | 2 | -18 | [10] |
| Colombia M2 | 9 | NO | 4.7 | -77.26 | Mangrove forest, departamento del Choco, Colombia | wet forest | old growth | 259 | 323 | 6781 | 22 | 20 | 1004 | 0 | 0 | [10] |
| CostaRic | 97 | NO | 10.38 | -83.98 | Horquetas, Sarapiqui Costa Rica | wet forest | old growth | 260 | 760 | 4042 | 28 | 62 | 1317 | 0 | 0 | [11] |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FrenchGu | 360 | YES | 5.3 | -53.5 | Piste de Saint Elie, near Sinnamary, French Guiana | moist forest | old growth | 259 | 542 | 2579 | 41 | 90 | 1402 | 2 | -103 | [12] |
| Gabon | 101 | NO | 0.95 | 13.17 | Makokou, Gabon | moist forest | old growth | 231 | 889 | 1657 | 56 | 528 | 1110 | 5 | -113 | [13] |
| Ghana | 39 | NO | 5.5 | -2.67 | Boi Tano Reserve, Ghana | moist forest | old growth | 267 | 992 | 1842 | 58 | 61 | 1329 | 4 | -188 | [14] |
| IndiaCha | 23 | YES | 25.05 | 83.21 | Chakia, India | dry forest | secondary | 262 | 5828 | 940 | 132 | 89 | 1487 | 9 | -922 | [15] |
| Jalisco | 124 | NO | 19.5 | -105.04 | Chamela station, Jalisco state, Mexico | dry forest | old growth | 261 | 1630 | 818 | 110 | 35 | 1524 | 10 | -889 | [16] |
| Kaliman1 | 23 | YES | -0.4 | 116.45 | Balikpapan, Kalimantan, Indonesia | moist forest | old growth | 266 | 203 | 2146 | 29 | 10 | 1433 | 3 | -43 | [17] |
| Kaliman2 | 69 | YES | -1.08 | 116.97 | Sebulu, Kalimantan, Indonesia | wet forest | old growth | 267 | 262 | 2377 | 20 | 38 | 1472 | 0 | 0 | [18] |
| Kaliman4 | 40 | NO | 1.95 | 117.08 | Berau Regency, Kalimantan, Indonesia | wet forest | old growth | 264 | 204 | 2498 | 13 | 80 | 1366 | 0 | 0 | [19] |
| Kaliman6 | 25 | NO | -0.52 | 115.37 | West Kutai, near Balikpapan, East Kalimantan, Indonesia | moist forest | old growth | 261 | 197 | 3201 | 25 | 85 | 1369 | 0 | 0 | [20] |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Karnataka | 189 | NO | 13.83 | 74.95 | Kilandur Reserve Forest, Shimoga district, Karnataka State, India | wet forest | old growth | 240 | 1392 | 4864 | 150 | 623 | 1533 | 7 | -801 | [21] |
| Llanosec | 24 | YES | 7.43 | -70.92 | Llanos secondary, Venezuela | dry forest | secondary | 268 | 483 | 1730 | 67 | 145 | 1463 | 4 | -447 | [22] |
| Llanosol | 27 | YES | 7.43 | -70.92 | Llanos old-growth, Venezuela | dry forest | old growth | 268 | 483 | 1730 | 67 | 145 | 1463 | 4 | -447 | [22] |
| Madagascar1 | 76 | NO | -14.45 | 49.05 | Bealanana, Analila, Madagascar | dry forest | old growth | 190 | 2106 | 1497 | 91 | 1154 | 1338 | 8 | -476 | [23] |
| Madagascar2 | 90 | NO | -20.45 | 47.6 | Fandriana, Fiadanana, Madagascar | dry forest | old growth | 178 | 2591 | 1714 | 74 | 1362 | 1138 | 6 | -170 | [23] |
| Madagascar3 | 87 | NO | -24.96 | 45.23 | Dry forest Manavy, Madagascar | dry forest | old growth | 242 | 3027 | 505 | 84 | 210 | 1430 | 12 | -921 | [23] |
| Madagascar4 | 80 | NO | -24.48 | 46.9 | Moist forest, Beampingaratra, Madagascar | dry forest | old growth | 207 | 2502 | 1239 | 65 | 986 | 1244 | 8 | -279 | [23] |
| Madagascar5 | 90 | NO | -22.44 | 46.99 | Ivohibe, Sakaroa, Madagascar | dry forest | old growth | 210 | 2555 | 1258 | 85 | 662 | 1171 | 8 | -353 | [23] |
| Malaysia | 139 | YES | 2.98 | 102.32 | Pasoh, Malaysia | moist forest | old growth | 263 | 478 | 1987 | 30 | 129 | 1399 | 3 | -26 | [24] |
| Malaysia2 | 24 | NO | 2.98 | 102.32 | Pasoh, Malaysia | moist forest | old growth | 263 | 478 | 1987 | 30 | 129 | 1399 | 3 | -26 | [25] |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MFrenchG | 29 | YES | 4.87 | -52.32 | Marais Leblond, Kourou, French Guiana | moist forest | old growth | 265 | 558 | 3305 | 52 | 14 | 1351 | 3 | -150 | [26] |
| MGuadel | 55 | YES | 16.27 | -61.57 | Grand Cul de Sac Marin, Guadeloupe | moist forest | old growth | 257 | 1225 | 1613 | 41 | 13 | 1509 | 4 | -321 | [27] |
| Moluccas | 25 | NO | -3.05 | 129.43 | Manusela National Park, Moluccas, Indonesia | moist forest | old growth | 250 | 732 | 2701 | 29 | 147 | 1375 | 2 | -1 | [28] |
| Mozambique | 28 | NO | -18.97 | 34.17 | Nhambita, Gorongosa district, Mozambique | dry forest | old growth | 246 | 2701 | 1048 | 89 | 148 | 1548 | 8 | -676 | [29] |
| NewGuinea | 42 | YES | -6 | 145.18 | Marafunga, New Guiena | wet forest | old growth | 134 | 607 | 2216 | 38 | 3047 | 1271 | 0 | -15 | [30] |
| Peru | 51 | NO | -12.92 | -69.27 | South East Peru (Tambopata) | moist forest | old growth | 253 | 1074 | 2546 | 52 | 222 | 1527 | 4 | -115 | [31] |
| PuertoRi | 30 | YES | 18.32 | -65.82 | El Verde, Puerto Rico | moist forest | old growth | 222 | 1258 | 2771 | 26 | 70 | 1685 | 3 | -30 | [32] |
| PuertoRi2 | 25 | NO | 17.98 | -66.67 | Ponce, Puerto Rico | dry forest | old growth | 260 | 1130 | 997 | 56 | 82 | 1509 | 9 | -486 | [33] |
| SaoPaulo3 | 75 | NO | -23.99 | -46.39 | Restinga (sandy soil) forest, Sao Paulo, Brazil | wet forest | old growth | 219 | 2264 | 2578 | 39 | 15 | 1125 | 0 | 0 | [35] |
| Sarawak | 21 | NO | 1.05 | 110.92 | Sabal Forest reserve, Sarawak, Malaysia | wet forest | old growth | 257 | 353 | 3344 | 23 | 96 | 1293 | 0 | 0 | [36] |
| SouthAfrica | 469 | NO | -23.83 | 31.1 | Pompey, Kruger Park, South Africa | dry forest | old growth | 221 | 3169 | 529 | 78 | 436 | 1481 | 12 | -948 | [37] |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SouthBrazil1 | 151 | NO | -9.86 | -58.41 | Cotriguacu, Mato Grosso, Brazil | dry forest | old growth | 249 | 547 | 1979 | 74 | 263 | 1290 | 5 | -376 | [38] |
| SouthBrazil2 | 49 | NO | -12.85 | -58.93 | Juruena, Mato Grosso, Brazil | dry forest | old growth | 237 | 868 | 2026 | 73 | 328 | 1378 | 5 | -382 | [38] |
| SouthBrazil3 | 64 | NO | -7.14 | -55.38 | Novo Progresso, Para, Brazil | moist forest | old growth | 257 | 453 | 2268 | 66 | 228 | 1244 | 4 | -273 | [38] |
| Sumatra | 29 | YES | -1.48 | 102.23 | Sepunggur, Jambi, Sumatra, Indonesia | wet forest | secondary | 267 | 275 | 2876 | 33 | 64 | 1436 | 0 | 0 | [39] |
| Sumatra2 | 11 | NO | -3.32 | 103.9 | Bendar Udara Pendopo, Sumatra, Indonesia | moist forest | old growth | 268 | 276 | 2782 | 38 | 60 | 1460 | 2 | -16 | [20] |
| Tanzania1 | 38 | NO | -6.33 | 35.78 | Manyara, Tanzania | dry forest | old growth | 221 | 1538 | 561 | 112 | 1195 | 1639 | 12 | -1094 | [40] |
| Tanzania2 | 42 | NO | -9.78 | 37.92 | Lindi, Tanzania | dry forest | old growth | 238 | 1386 | 872 | 104 | 526 | 1624 | 9 | -920 | [40] |
| Tanzania3 | 38 | NO | -6.35 | 30.95 | Katavi, Tanzania | dry forest | old growth | 246 | 949 | 1117 | 91 | 1118 | 1582 | 6 | -824 | [40] |
| Tanzania4 | 34 | NO | -5.3 | 32.97 | Tabora, Tanzania | dry forest | old growth | 232 | 1201 | 1062 | 91 | 1174 | 1782 | 7 | -917 | [40] |
| Venezuela 2 | 40 | NO | 1.92 | -67.03 | San Carlos de Rio Negro, Venezuela | wet forest | old growth | 262 | 415 | 3424 | 24 | 94 | 1344 | 0 | 0 | [41] |
| WestJava | 41 | NO | -6.575 | 106.51 | Bogor, West Java, Indonesia | moist forest | old growth | 249 | 324 | 3966 | 20 | 526 | 1542 | 0 | 0 | [20] |
| Yucatan | 175 | YES | 20 | -88 | La Pantera, Yucatan, Mexico | dry forest | old growth | 258 | 1678 | 1222 | 54 | 24 | 1554 | 8 | -482 | [42] |
| Zambia | 141 | NO | -15.25 | 29.83 | Central Zambia | dry forest | old growth | 221 | 3083 | 823 | 118 | 1017 | 1563 | 9 | -968 | [43] |

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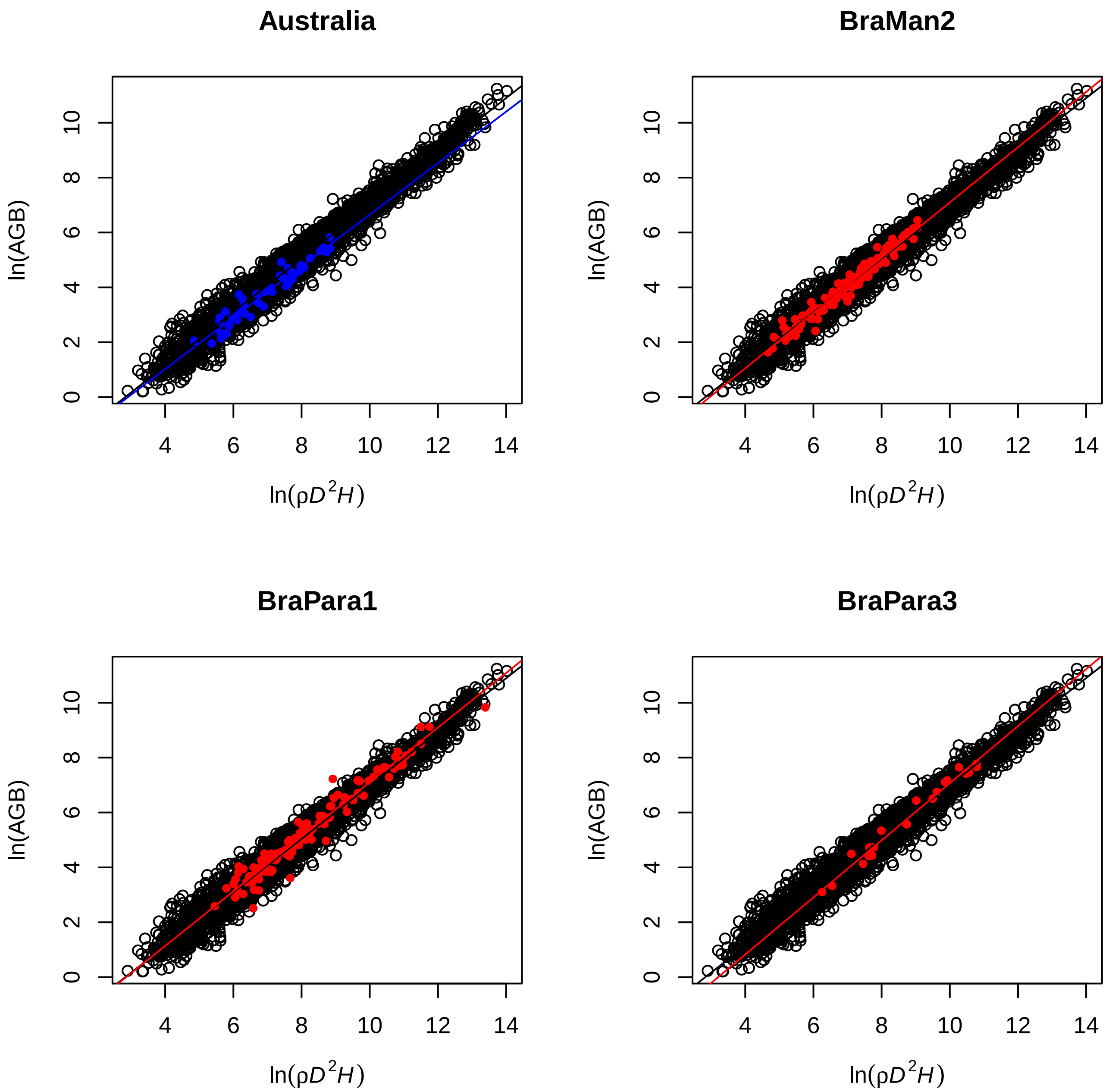

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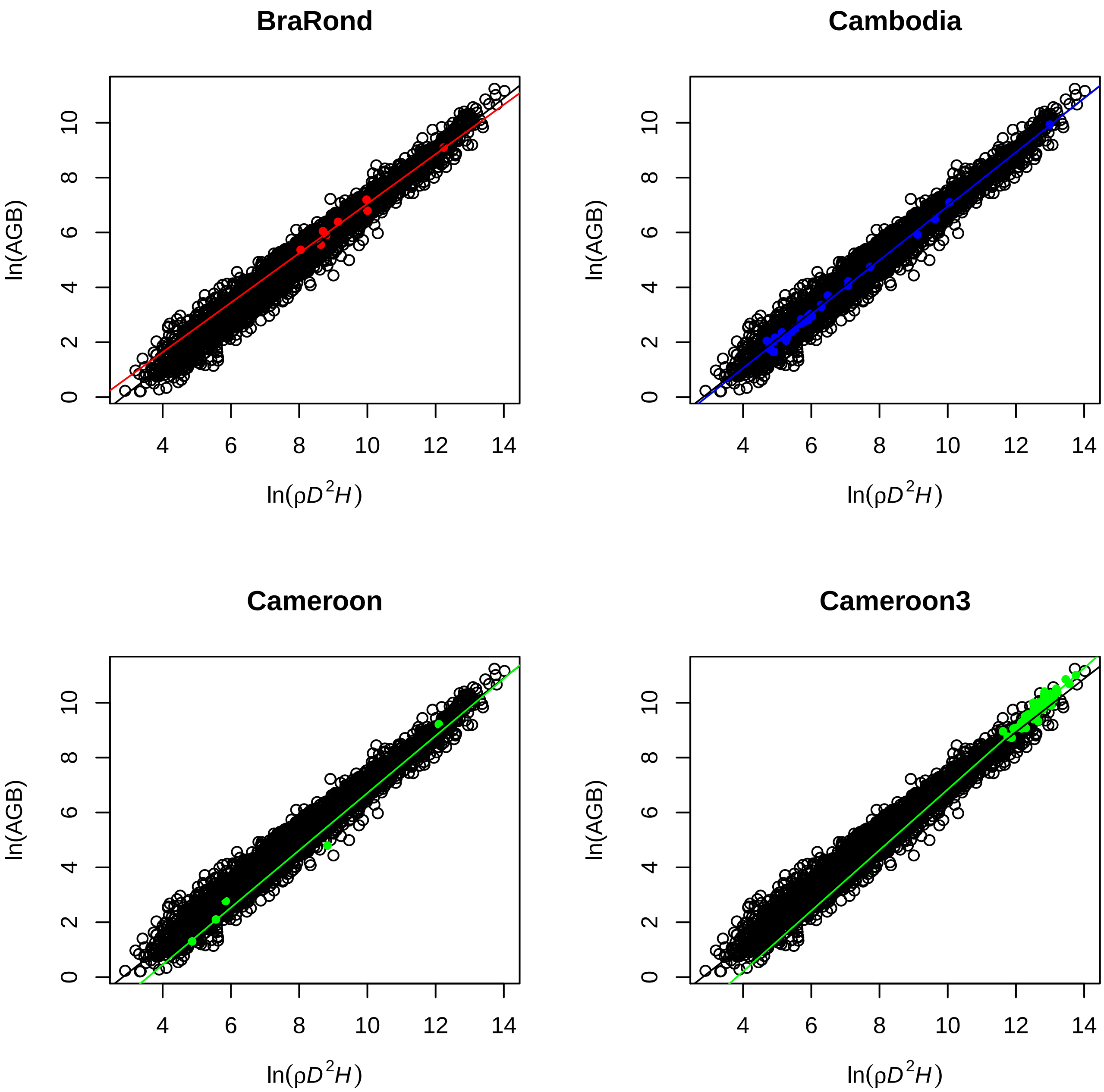
BraMan2
BraPara1
BraPara3
ln(AGB)
ln(ρD²H)
0
2
4
6
8
10
12
14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Cambodia
Cameroon
Cameroon3
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ln(ρD²H)
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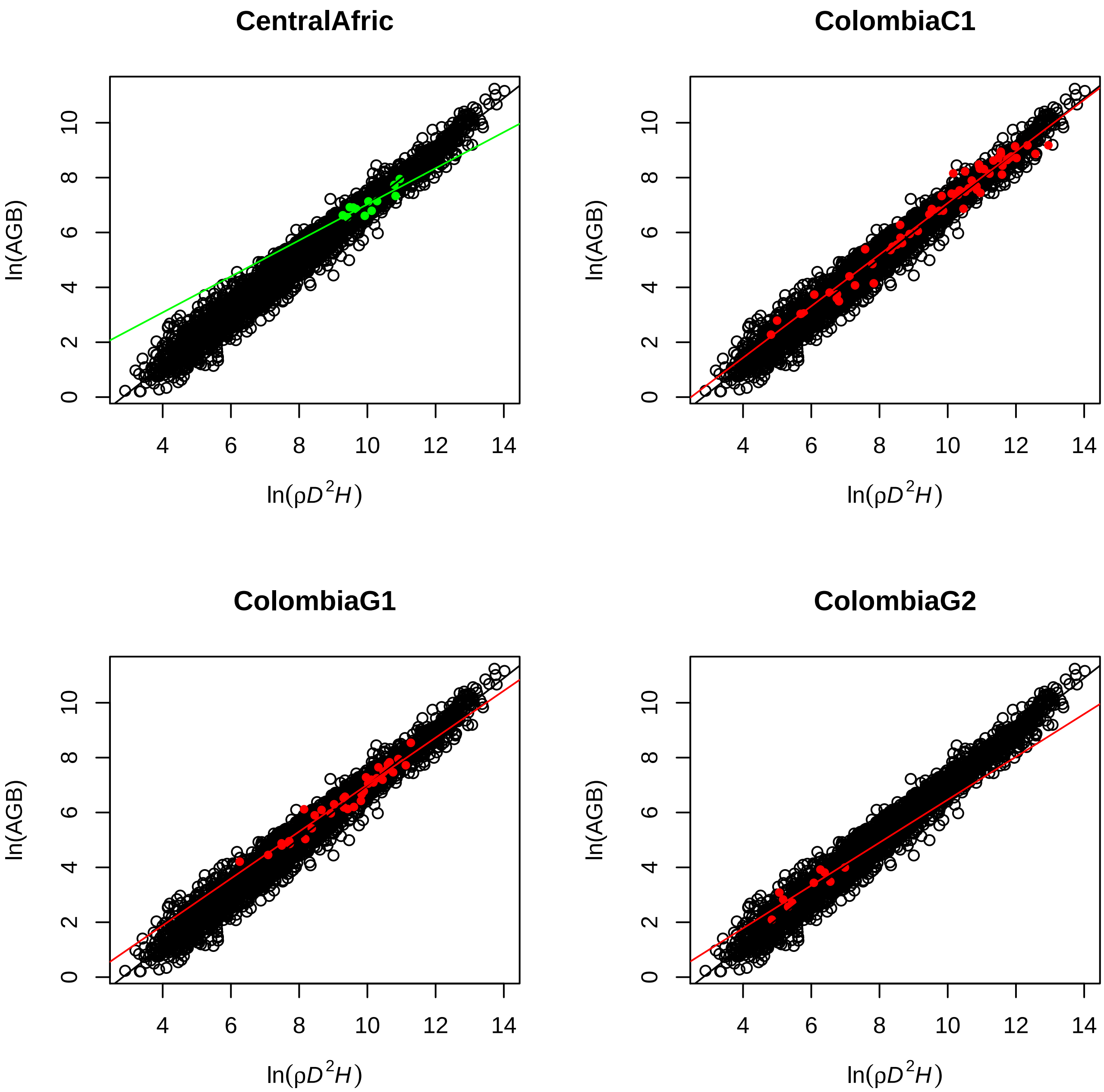
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ColombiaG1
ColombiaG2
ln(AGB)
ln(ρD²H)
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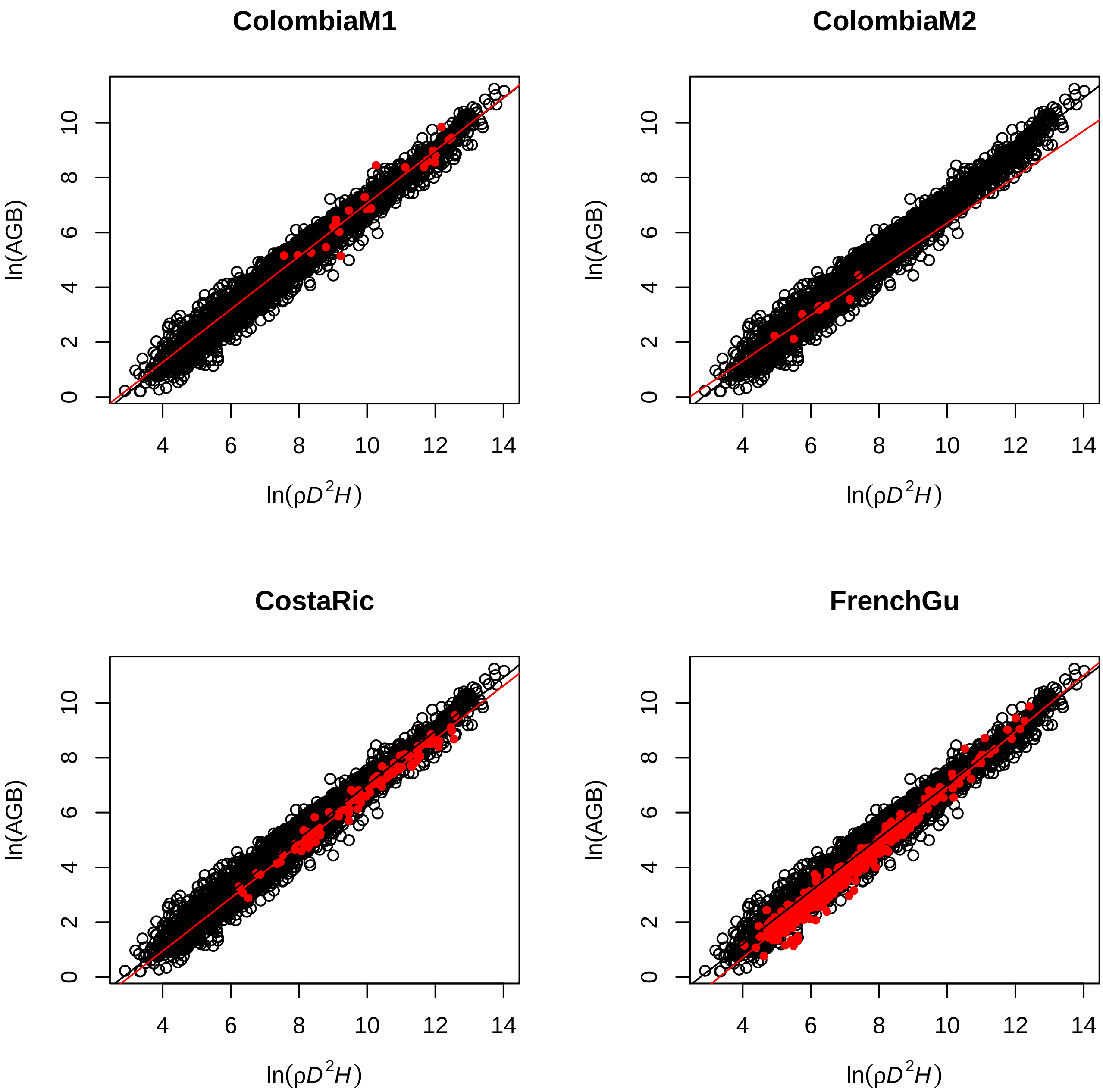

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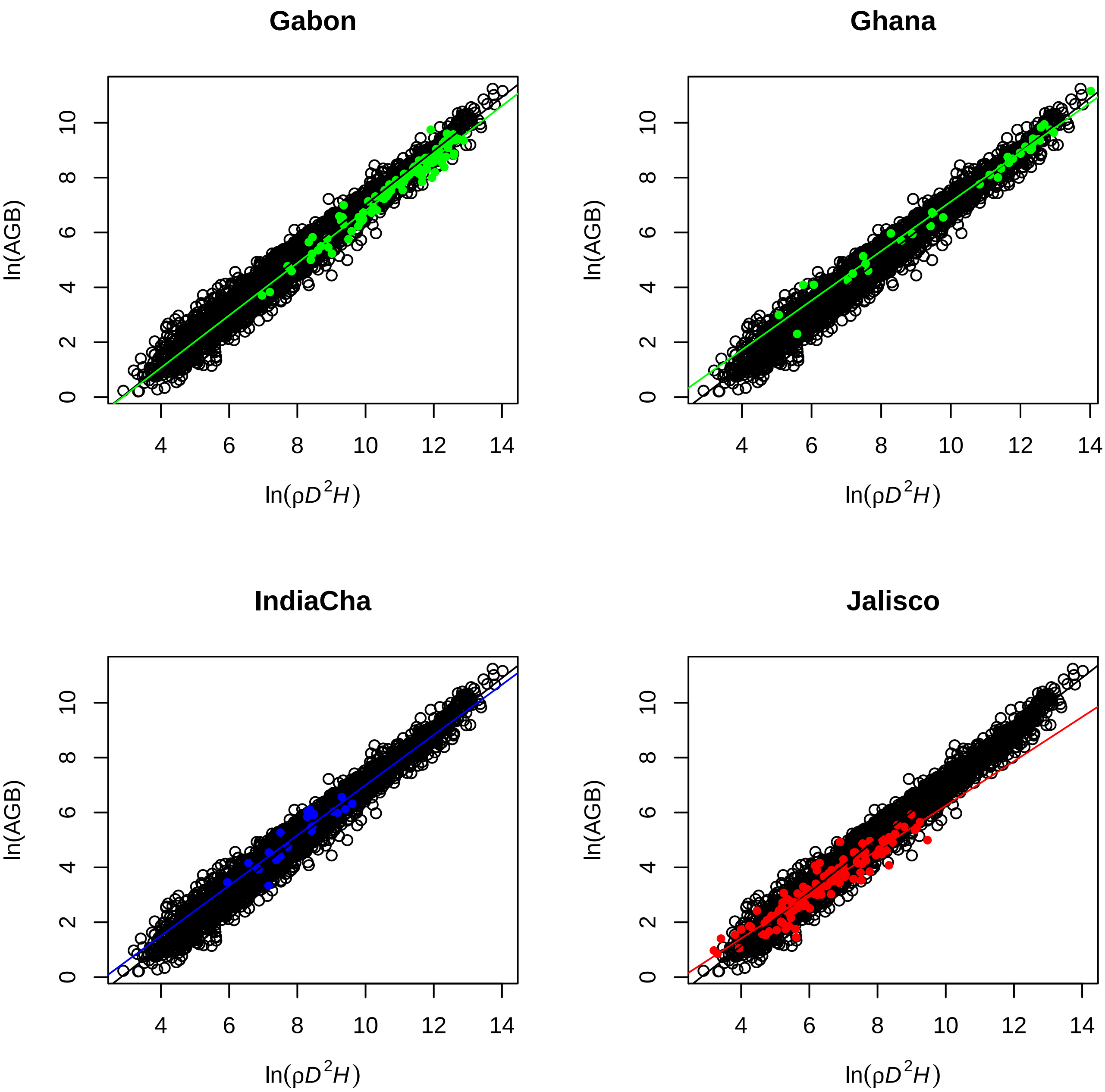
ColombiaM2
CostaRic
FrenchGu
ln(AGB)
0 2 4 6 8 10
4 6 8 10 12 14
ln(ρD²H)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IndiaCha
Jalisco
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ln(ρD²H)
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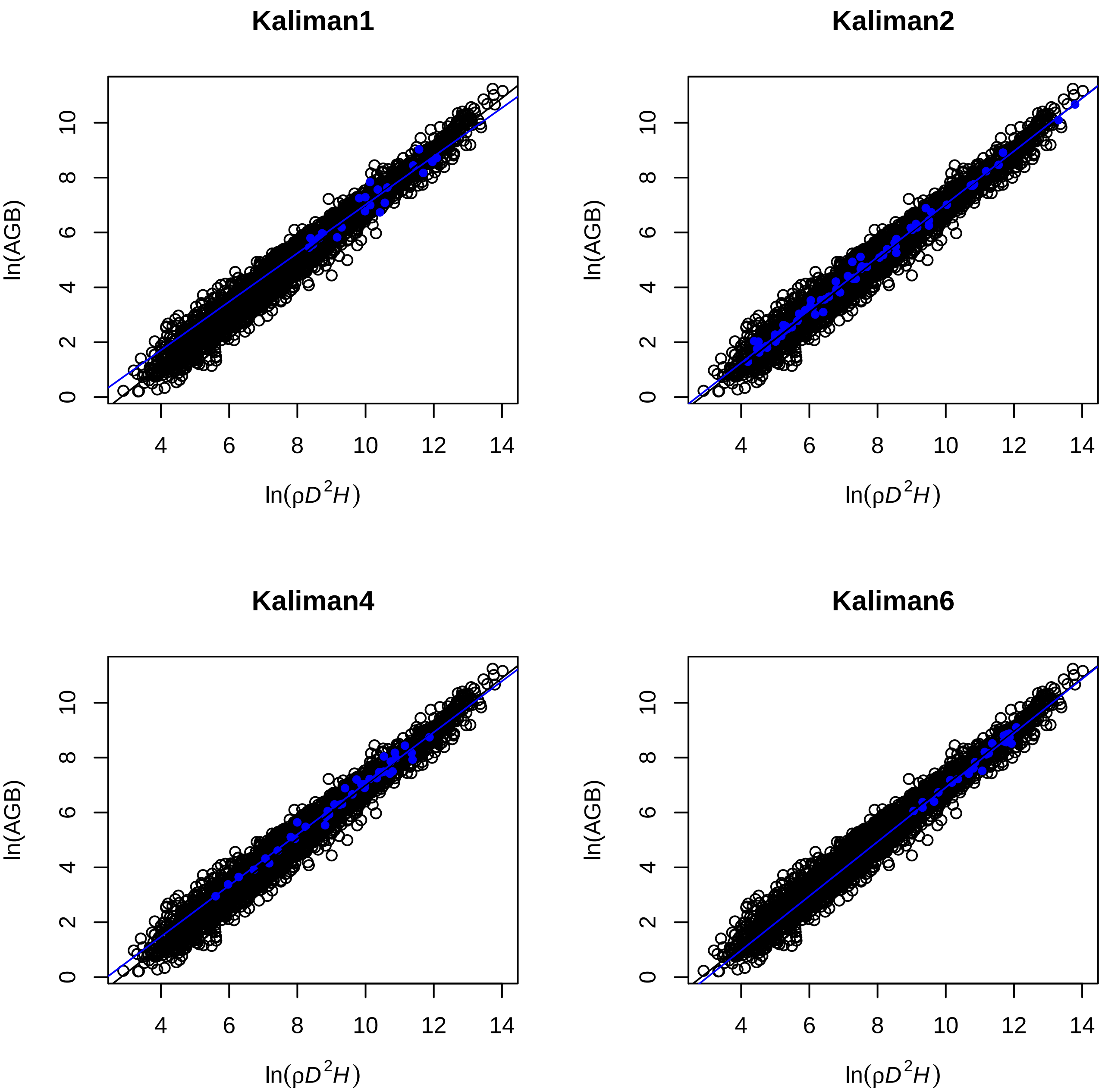
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Kaliman2
Kaliman4
Kaliman6
ln(AGB)
$\ln(\rho D^2 H)$
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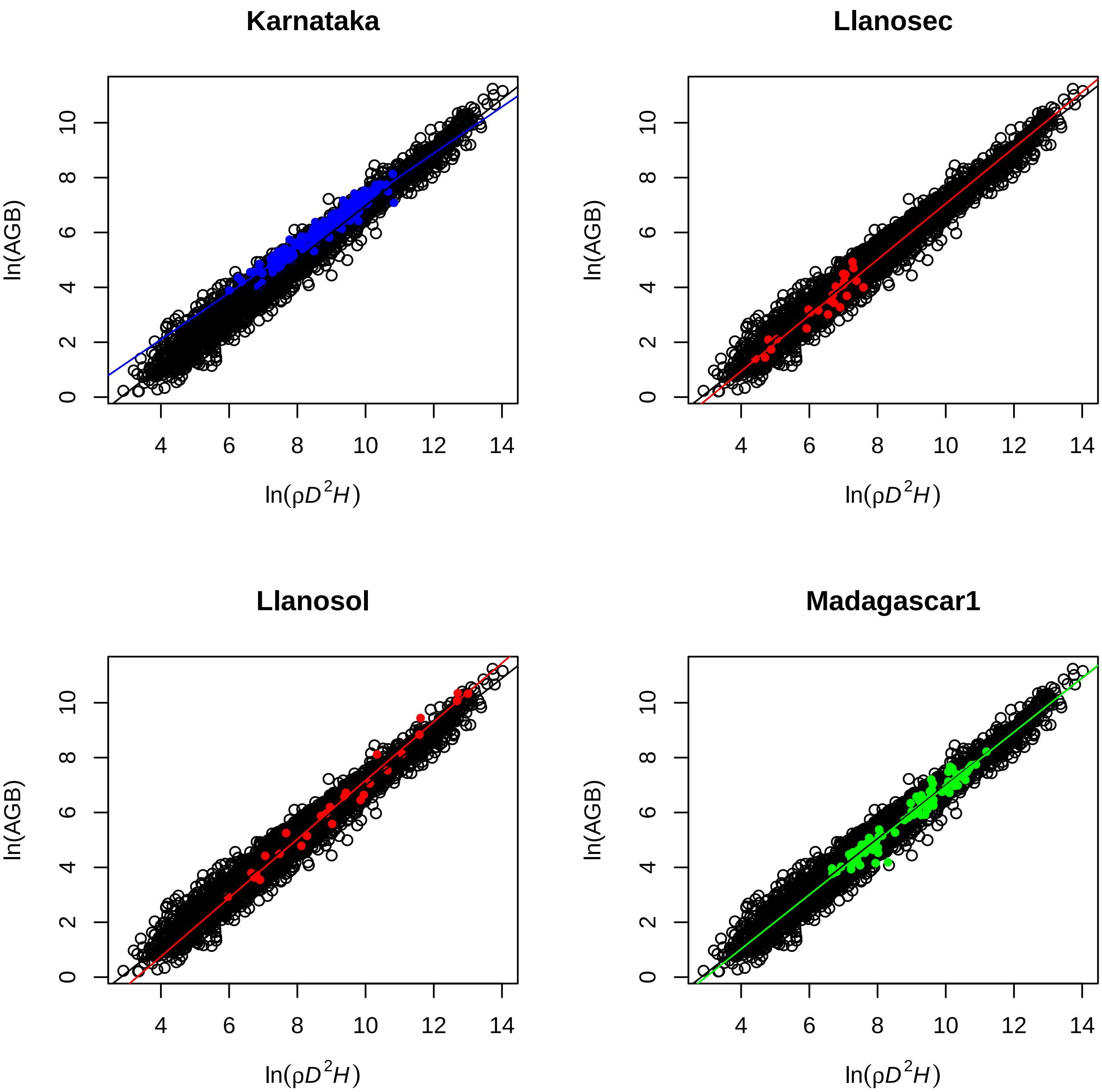
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Madagascar1
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ln(ρD²H)
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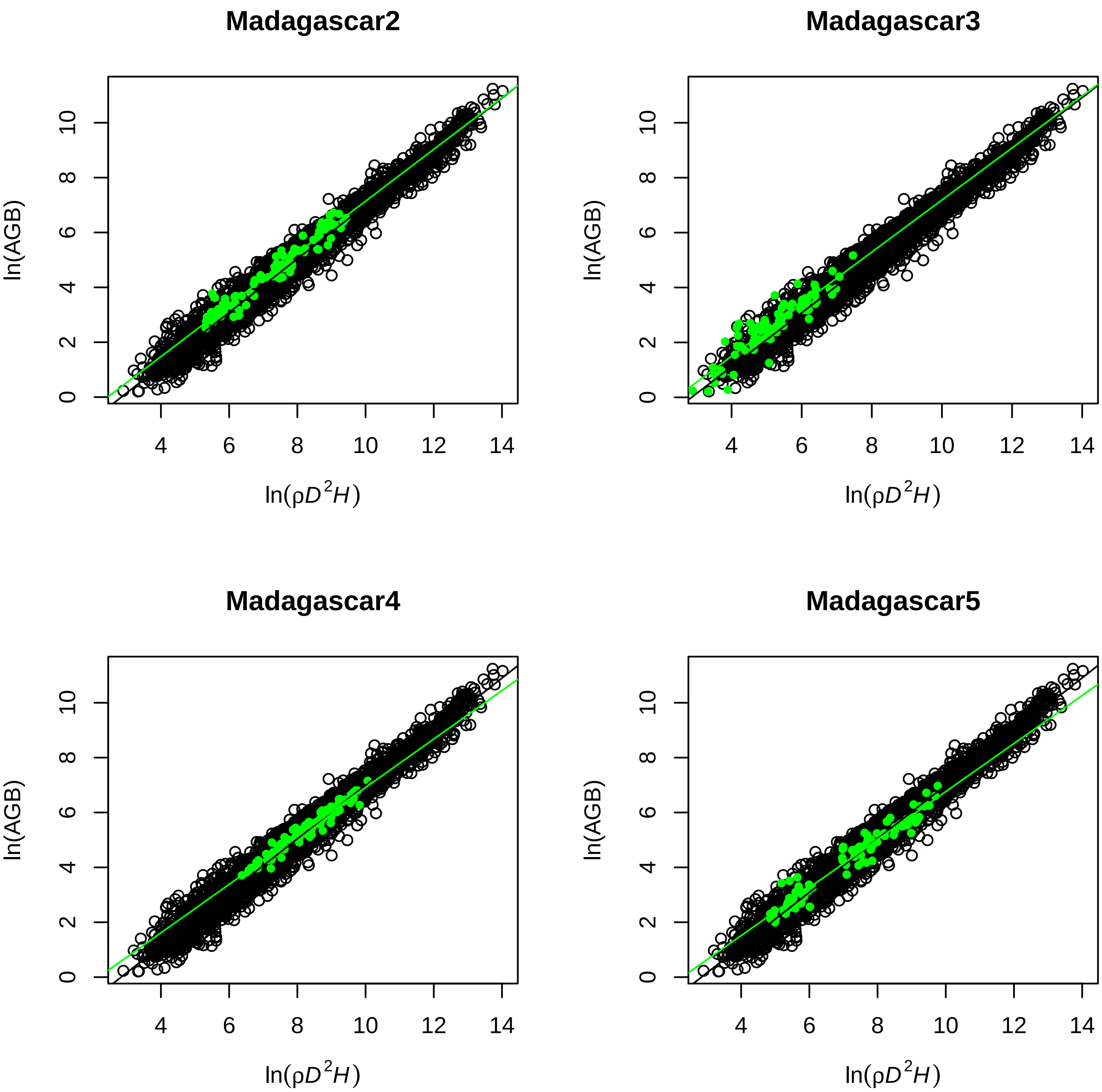
14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Madagascar3
Madagascar4
Madagascar5
ln(AGB)
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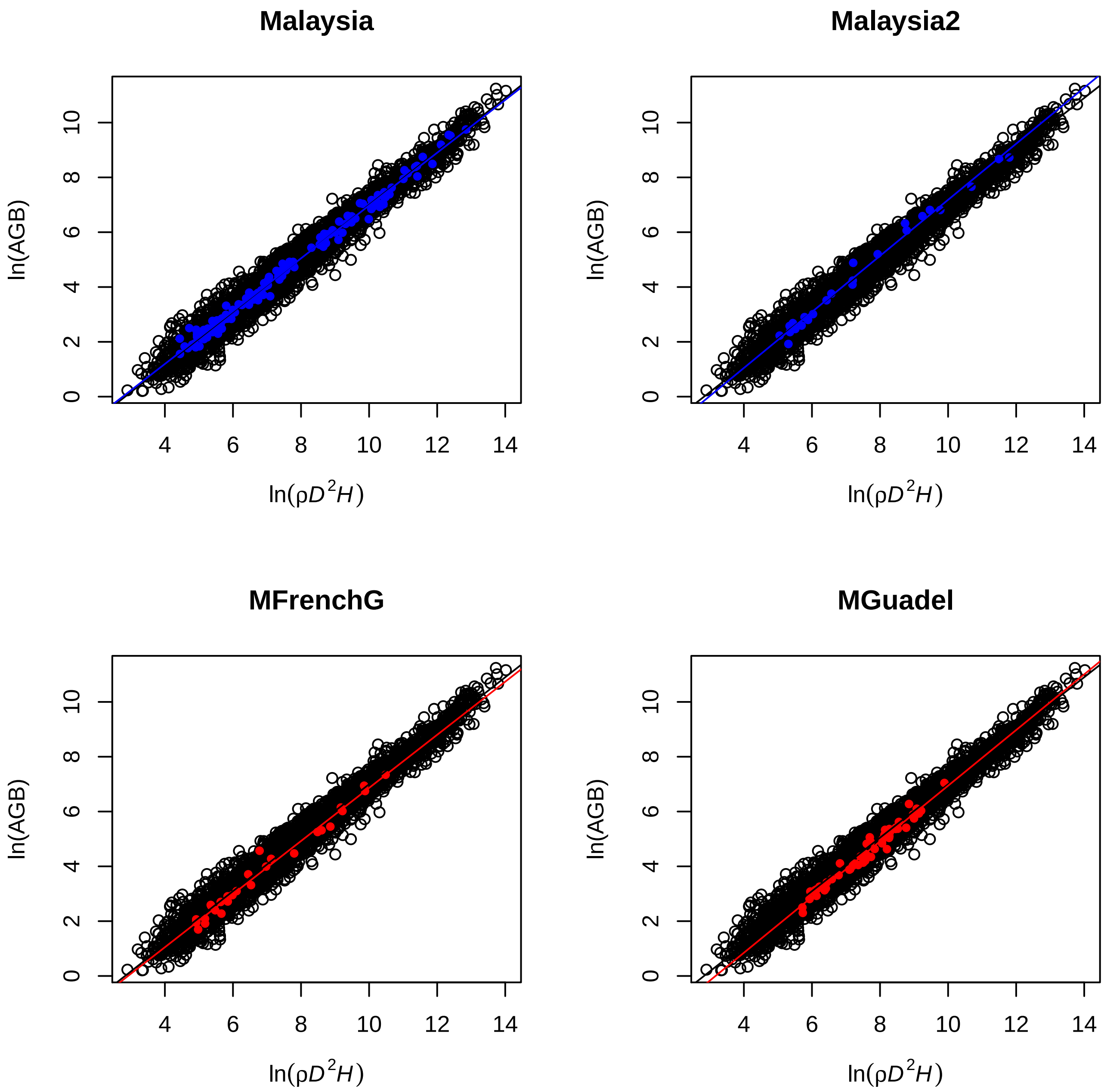
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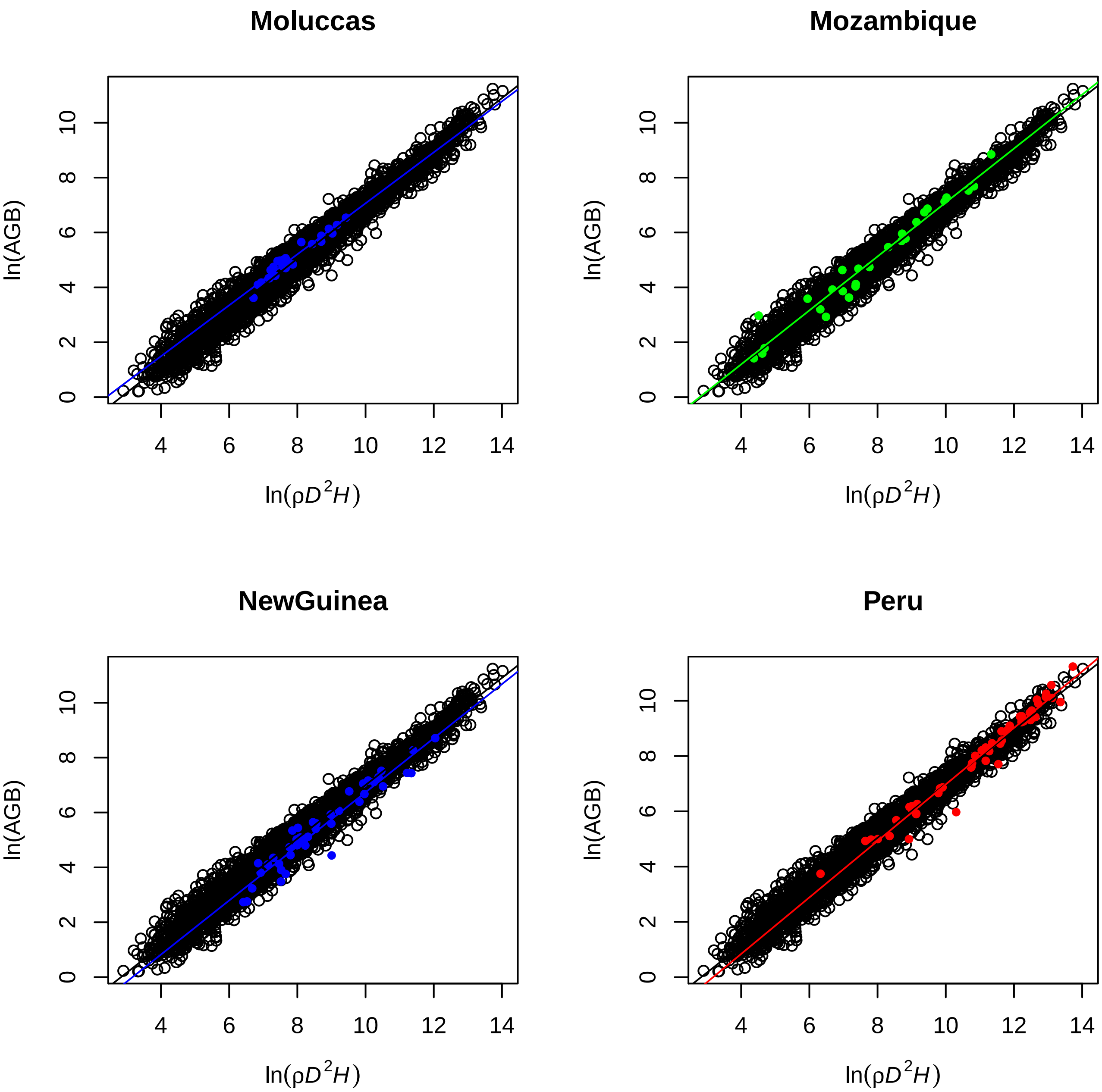

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Mozambique
NewGuinea
Peru
ln(AGB)
ln(ρD²H)
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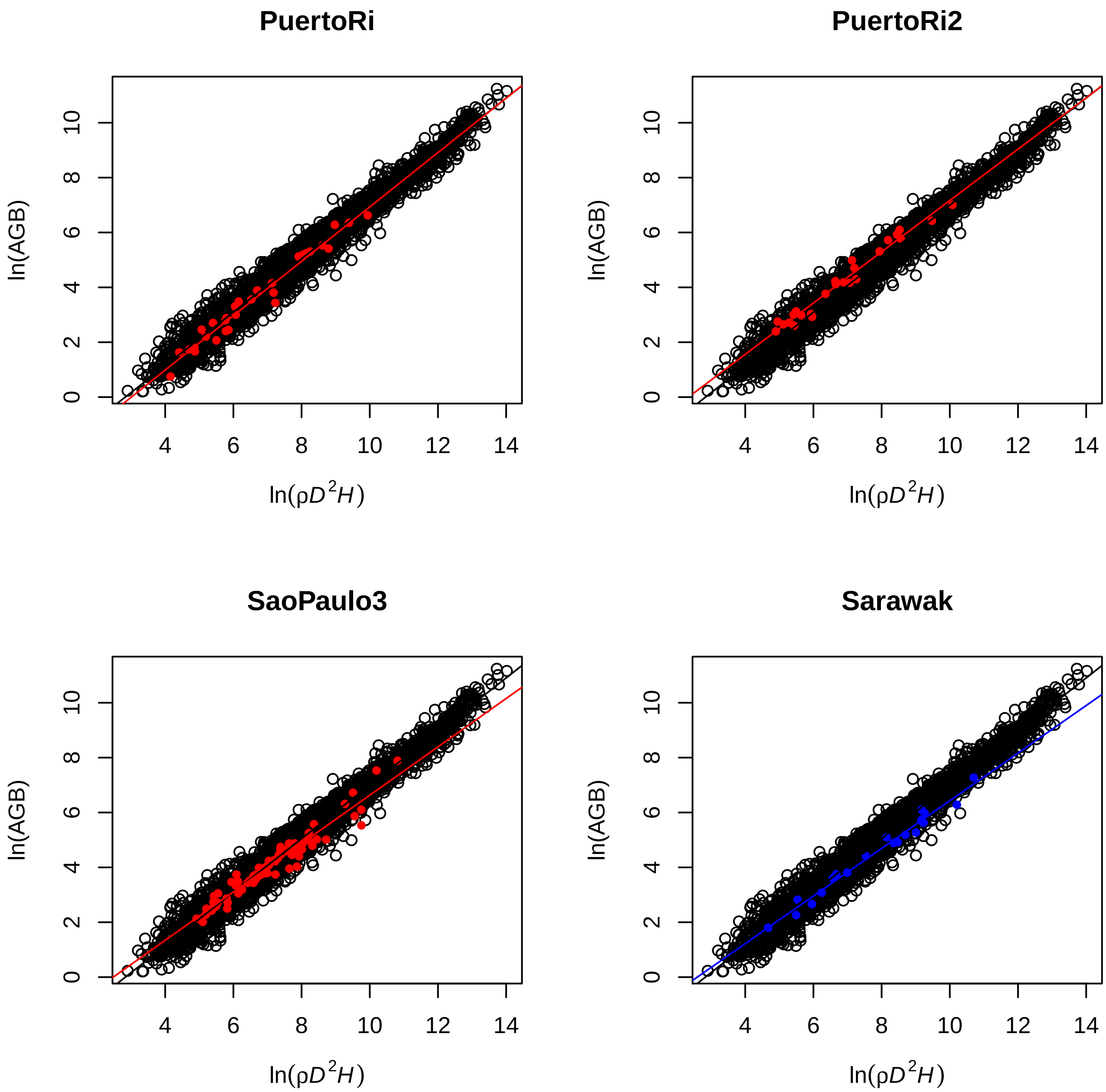
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PuertoRi2
SaoPaulo3
Sarawak
ln(AGB)
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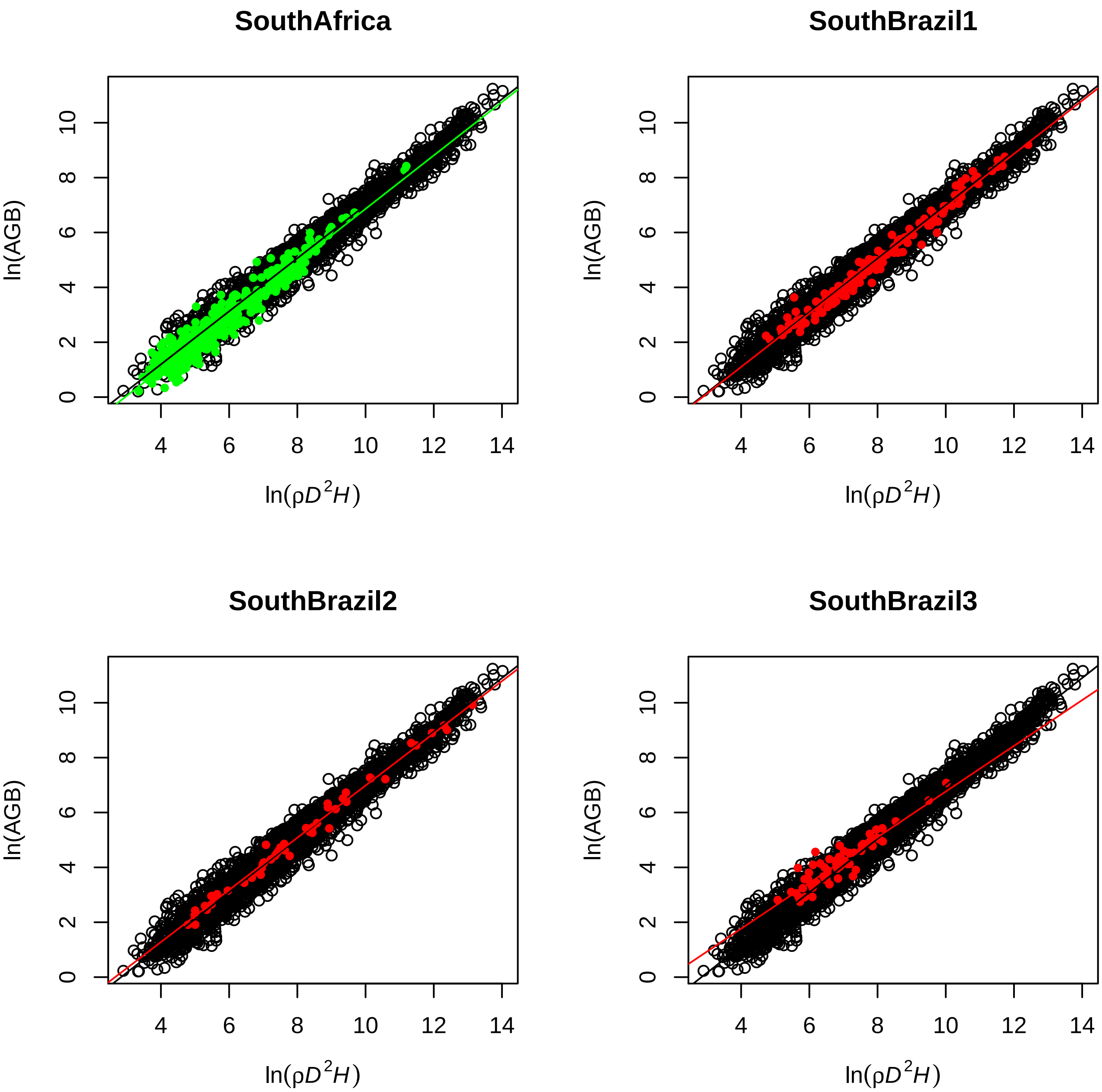
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SouthBrazil1
SouthBrazil2
SouthBrazil3
ln(AGB)
ln(ρD²H)
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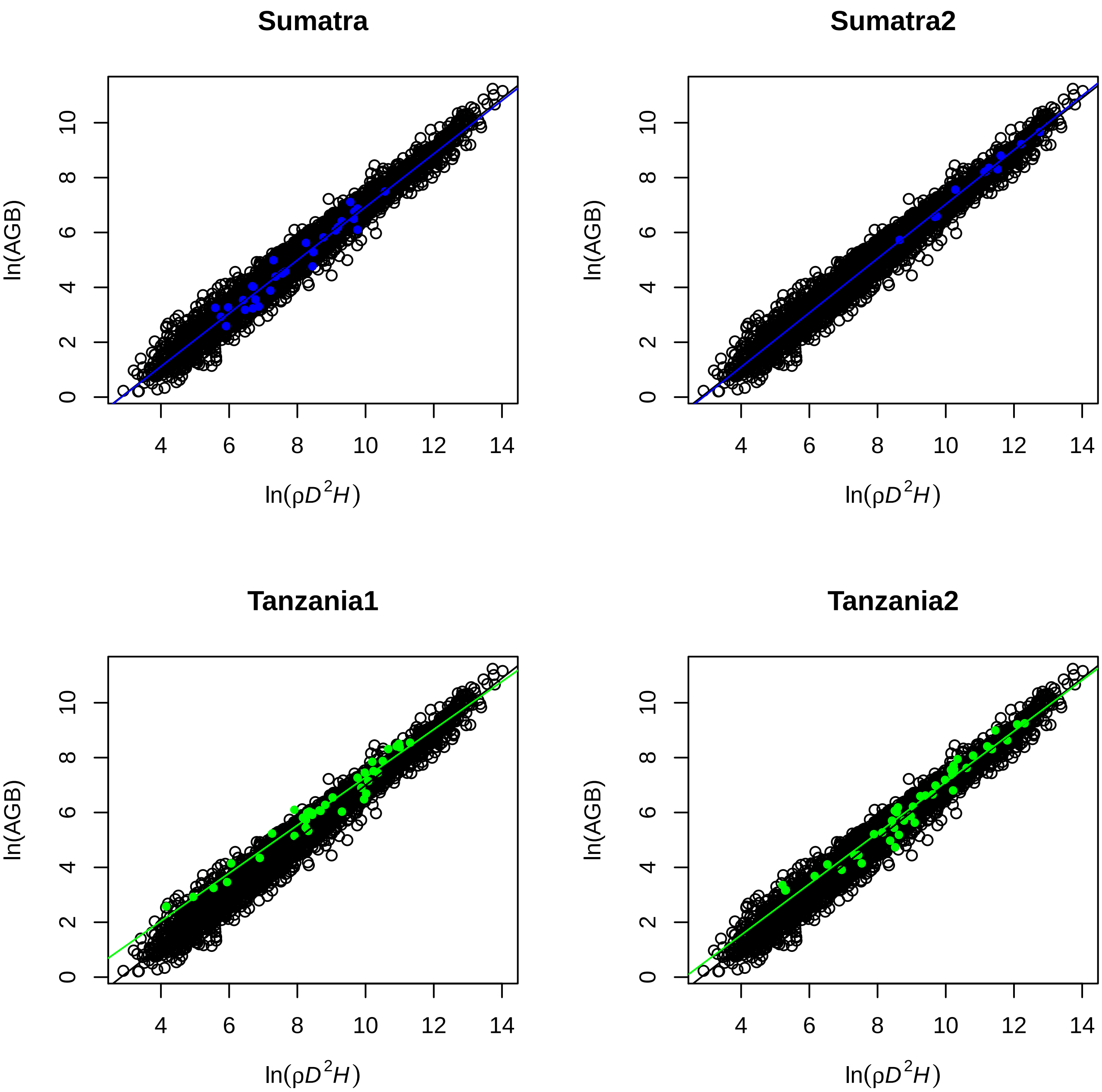
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Sumatra2
Tanzania1
Tanzania2
ln(AGB)
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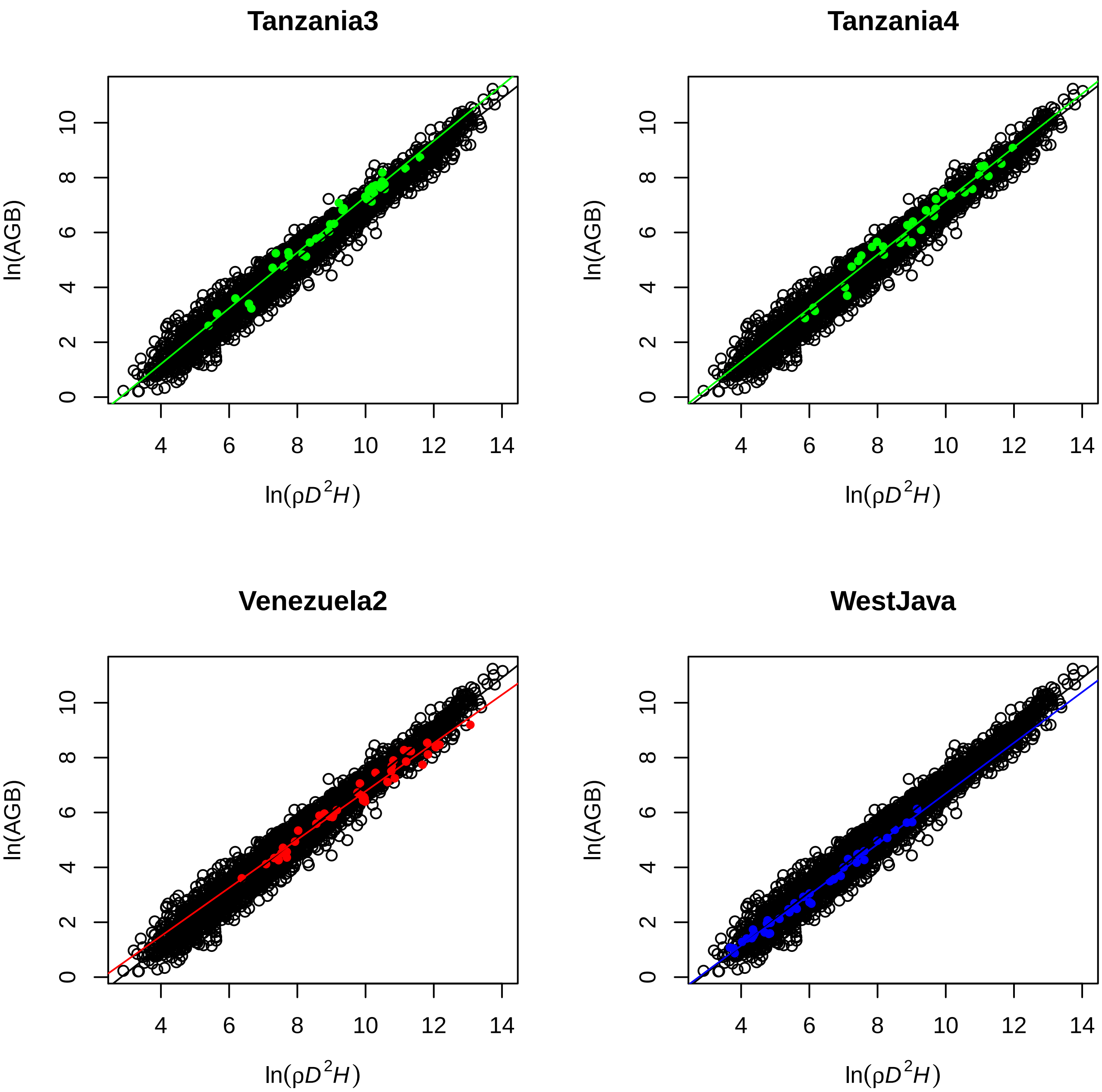

Tanzania3
Tanzania4
Venezuela2
WestJava
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ln(ρD²H)
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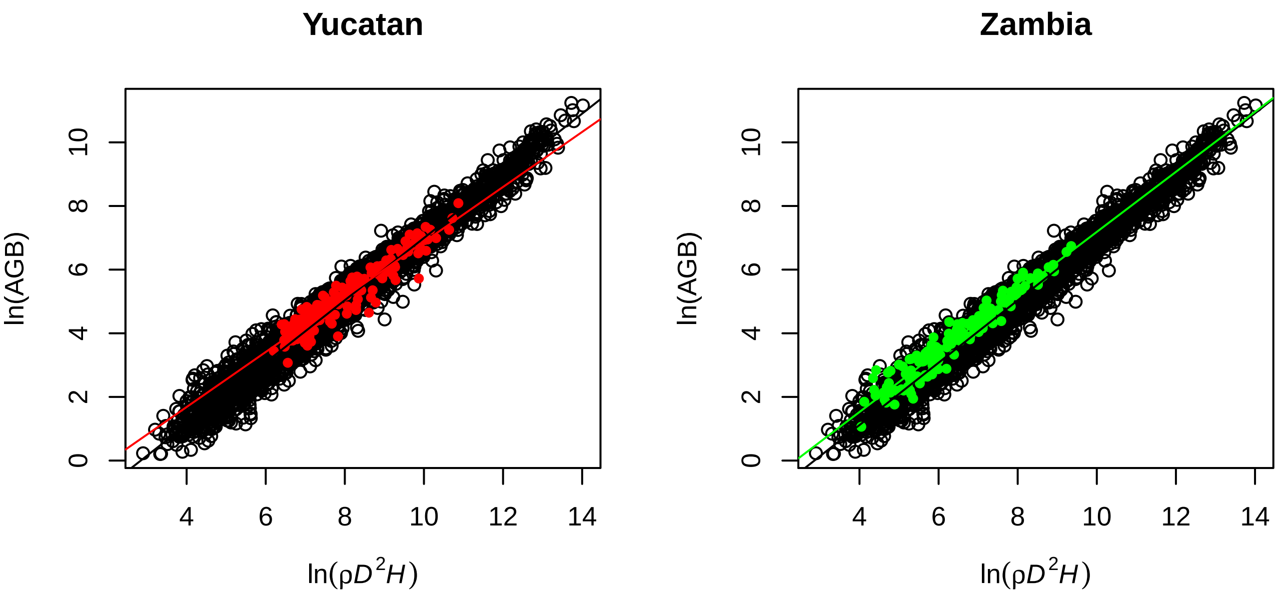
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Zambia
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ln(ρD²H)
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