doi:10.1038/nature11390

**Supplementary Tables**

| Location | r |
|---|---|
| Amazon Forest (AB; 10-0$^{o}$S; 60-70$^{o}$W) | -0.44 |
| Minas Gerais (10-20$^{o}$S, 40-50$^{o}$W) | 0.5 |
| Congo Basin (CB, 5$^{o}$N-5$^{o}$S, 15-25$^{o}$E) | -0.05 |
| South of Congo Basin (ZA, 10-20$^{o}$S, 20-30$^{o}$E) | 0.14 |

Table 1. Correlation (r) between cumulative exposure of air mass to vegetation (∑LAI) and distance travelled by air mass over land calculated across daily back trajectories for the period 2001 to 2007.

| Region | Season | Calendar month | Mean rain (mm day$^{-1}$) | Function | | | ΔRain (kg m$^{-2}$) | ΔΣ ET (kg m$^{-2}$) | $\Delta q_{initial}$ (kg m$^{-3}$); q(3) /q(1) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | a | b | c | | | |
| Amazon Forest | Wet | Dec, Jan - May | 9.3 | -735 | -0.39 | 9.8 | 0.3 | 20.8 | 0.009; 2.3 |
| | Dry | Jun - Nov | 4.8 | -12.3 | 0.002 | 19.7 | 0.1 | 23.0 | 0.010; 2.5 |
| Minas Gerais | Wet | Nov – Dec, Jan- Mar | 6.8 | -9.7 | -0.13 | 11.6 | 8.5 | 28.6 | 0.012 ; 6.6 |
| | Dry | Apr - Oct | 0.9 | -28.9 | -0.01 | 28.9 | 2.9 | 13.0 | 0.009 ; 19 |
| Congo Basin | Wet | Mar – Apr, Sep- Dec | 5.2 | -3492 | -11.5 | 5.4 | 1.2 | 19.8 | 0.009 ; 2.3 |
| | Dry | Jan, Feb, May - Aug | 2.9 | -16.9 | -0.0001 | 19.9 | 1.2 | 21.8 | 0.010; 3.2 |
| South of Congo Basin | Wet | Jan – Mar, Nov - Dec | 0.4 | -5.7 | -0.2 | 6.4 | 4.4 | 21.8 | 0.013 ; 6.5 |
| | Dry | Apr - Oct | 5.1 | -14.4 | -0.009 | 14.3 | 1.1 | 11.2 | 0.009 ; 32 |

Table 2. Water cycle statistics for the dry and wet season, assigned as months with less than and greater than average annual precipitation over the period 2001 to 2007. Typical calendar months corresponding to dry and wet season and average precipitation during that period are shown as well as difference in average daily precipitation (ΔRain) and difference in cumulative continental evapotranspiration (ΔΣET) that occurs between air masses with large (top decile of ΣLAI) and small (bottom decile of ΣLAI) exposure to vegetation. Fits to function $f(x) = a \exp(b \times x) + c$ are reported. Table also compares the initial specific humidity of the back trajectories comparing lower and upper tercile through reporting mean difference ($\Delta q_{initial}$) and the ratio (q(3)/q(1)).

**Supplementary Figures**

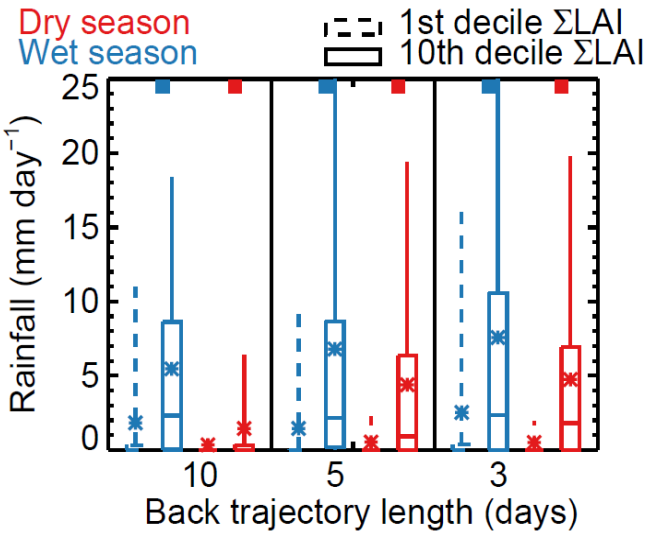


Fig. 1. Comparison of precipitation for air masses that have been exposed to small and large amounts of vegetation during atmospheric transport to the Minas Gerais (10-20°S, 40-50°W). The plot compares the length of the back trajectory over which ΣLAI is calculated (10, 5 and 3 days). Results are shown for back trajectories with intertercile initial specific humidity of the back trajectory (mean: star, median: line, 25th and 75th: box and 5th and 95th percentiles: whisker). Results are shown for the year 2001. Significant ($p<0.01$) differences indicated by squares at top of panel.

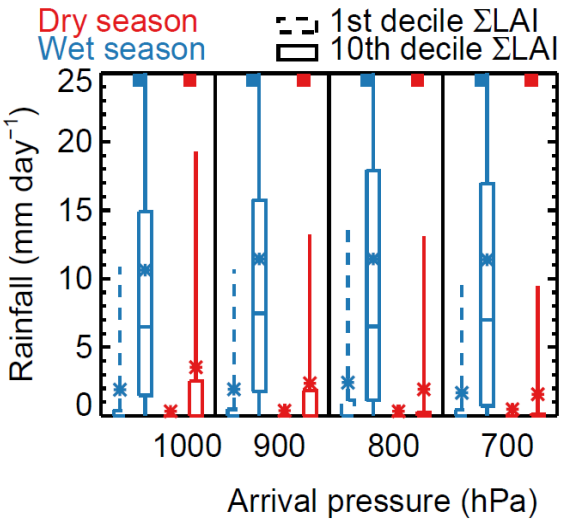


Fig. 2. Comparison of precipitation for air masses that have been exposed to small and large amounts of vegetation during atmospheric transport to the Minas Gerais (10-20°S, 40-50°W). The plot compares different arrival pressures of the back trajectories (surface, 900 hPa, 800 hPa, 700 hPa). Results are shown for back trajectories with intertercile initial specific humidity of the back trajectory. The box and whisker plots show mean (star), median (horizontal line), 25$^{th}$ and 75$^{th}$ (box) and 5$^{th}$ and 95$^{th}$ (whisker) percentiles. Significant ($p<0.01$) differences indicated by squares at top of panel.

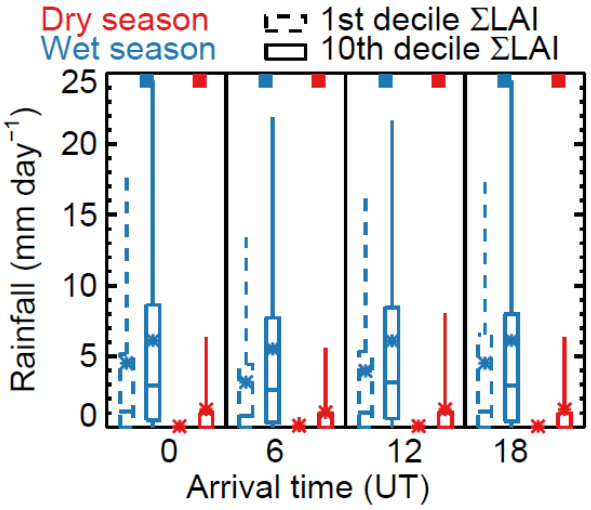


Fig. 3. Comparison of precipitation for air masses that have been exposed to small and large amounts of vegetation during atmospheric transport to South of Congo (ZA, 10-20°S, 20-30°E). The plot compares the arrival time of the back trajectories (0000, 0600, 1200 and 1800 UT). Results are shown for the year 2001 for back trajectories with intertercile initial specific humidity of the back trajectory (mean: star, median: line, 25$^{th}$ and 75$^{th}$: box and 5$^{th}$ and 95$^{th}$ percentiles: whisker). Significant ($p<0.01$) differences indicated by squares at top of panel.

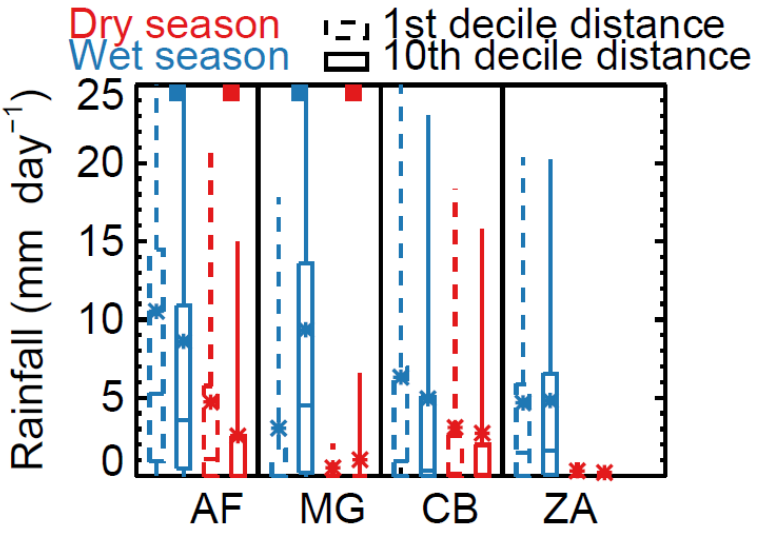


Fig. 4. Comparison of precipitation for air masses that have travelled small and large continental distances during atmospheric transport to 4 regions of the tropics: Amazon Basin (AB; 10-0$^{o}$S; 60-70$^{o}$W), Minas Gerais (MG), Congo Basin (CB, 5$^{o}$N-5$^{o}$S, 15-25$^{o}$E) and South of Congo (ZA, 10-20$^{o}$S, 20-30$^{o}$E). Results are shown for back trajectories with intertercile initial specific humidity of the back trajectory (mean: star, median: line, 25$^{th}$ and 75$^{th}$: box and 5$^{th}$ and 95$^{th}$ percentiles: whisker). Significant ($p<0.01$) differences indicated by squares at top of panel.

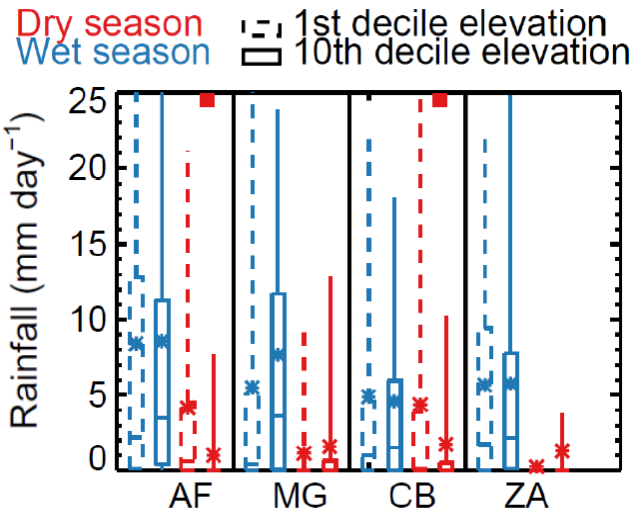


Fig. 5. Comparison of precipitation for air masses that have on average travelled over low and high elevation during atmospheric transport to 4 regions of the tropics: Amazon Basin (AB; 10-0°S; 60-70°W), Minas Gerais (MG), Congo Basin (CB, 5°N-5°S, 15-25°E) and South of Congo (ZA, 10-20°S, 20-30°E). Results are shown for back trajectories with intertercile initial specific humidity of the back trajectory (mean: star, median: line, 25$^{th}$ and 75$^{th}$: box and 5$^{th}$ and 95$^{th}$ percentiles: whisker). Significant ($p<0.01$) differences indicated by squares at top of panel.

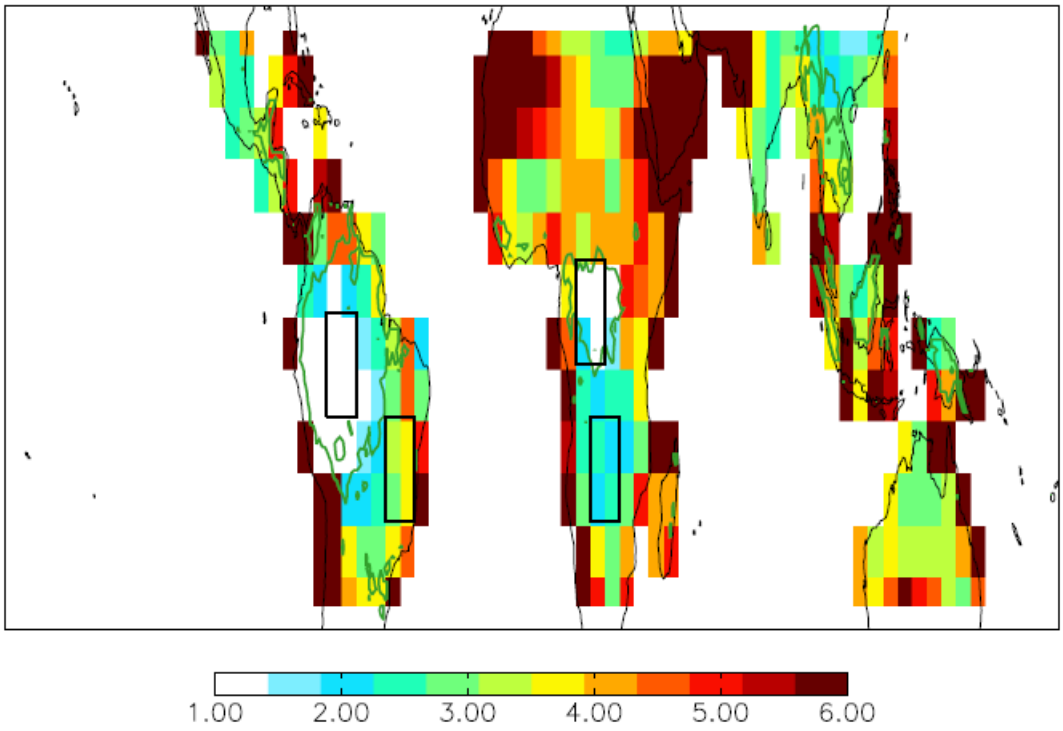


Fig. 6. Spatial distribution of the annual long-term (2001-2007) mean difference in prior exposure of air masses to vegetation. The plot compares air masses that have been exposed to large and small amounts of vegetation during the prior 10 days of atmospheric transport calculated as [ΣLAI($10^{th}$ decile) – ΣLAI($1^{st}$ decile)] / ΣLAI ($5^{th}$ decile) . The green solid contour delimits areas with high annual mean LAI (> 3 $m^2$ $m^{-2}$).

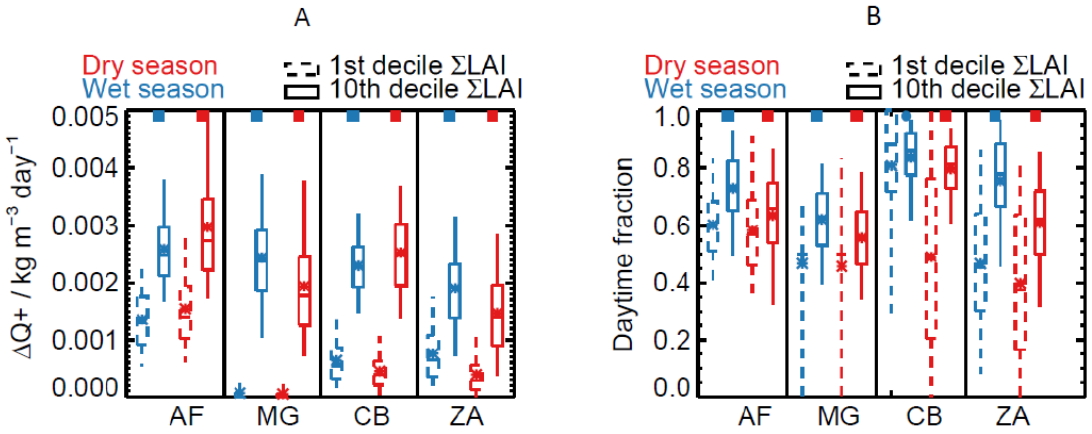


Fig. 7. Comparison of specific humidity for air masses that have been exposed to small and large amounts of vegetation during atmospheric transport to the Minas Gerais (10-20°S, 40-50°W). (A) Comparison of specific humidity (Q) restricted to time steps when Q increased (ΔQ+), (B) fraction of ΔQ+ plotted in (A) that occurs during local daylight hours. Results are shown for back trajectories with intertercile initial specific humidity of the back trajectory. The box and whisker plots show mean (star), median (horizontal line), 25$^{th}$ and 75$^{th}$ (box) and 5$^{th}$ and 95$^{th}$ (whisker) percentiles. Significant ($p<0.01$) differences indicated by squares at top of panel.

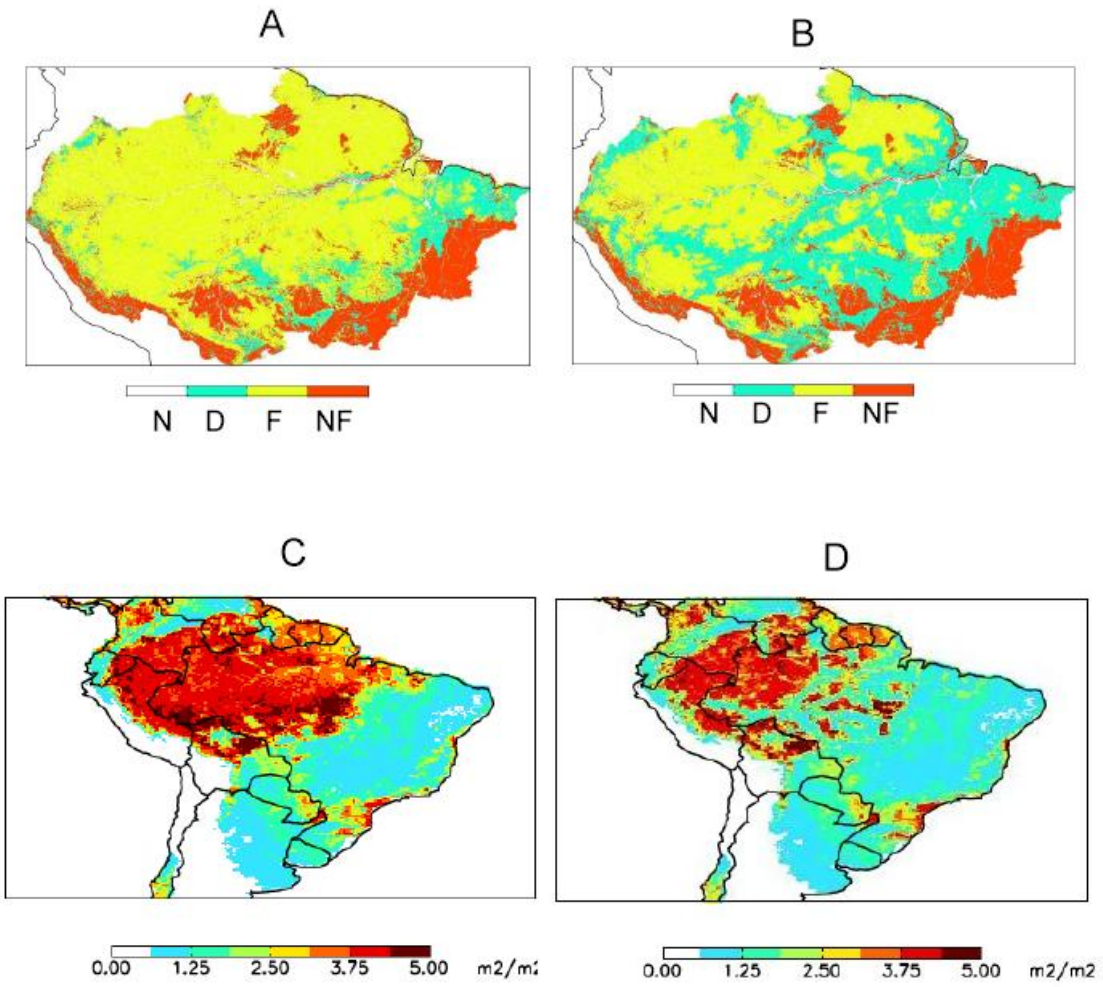


Fig. 8. Present and projected future forest cover in the Amazon. Forest cover (Null data, outside Amazon Basin (N); Deforested (D); Forest (F); Non-forest (NF)) in A) 2001 and B) 2050 under a business-as-usual deforestation scenario predicted by Soares-Filho et al. (2006). C) Leaf-area-index (LAI) observed by MODIS in 2001. D) Estimated LAI for 2050 under business-as-usual deforestation.

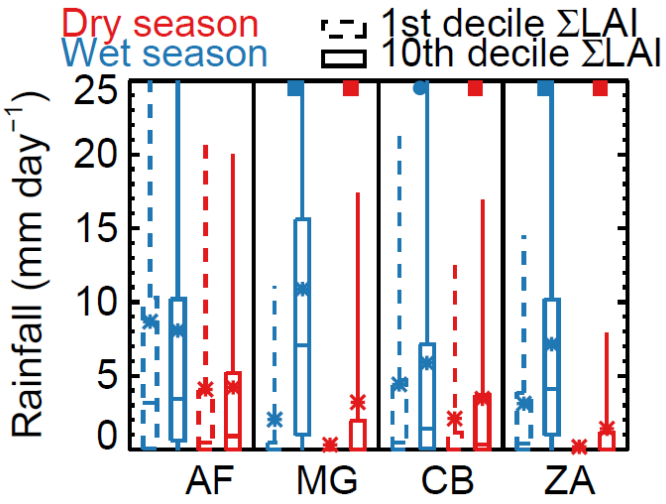


Fig. 9. Comparison of precipitation for air masses that have been exposed to small and large amounts of vegetation during atmospheric transport to 4 regions of the tropics: Amazon Basin (AB; 10-0$^{o}$S; 60-70$^{o}$W), Minas Gerais (MG), Congo Basin (CB, 5$^{o}$N-5$^{o}$S, 15-25$^{o}$E) and South of Congo (ZA, 10-20$^{o}$S, 20-30$^{o}$E). ΣLAI is calculated only when back trajectory pressure is greater than 850 hPa. Results are shown for back trajectories with intertercile initial specific humidity of the back trajectory (mean: star, median: line, 25$^{th}$ and 75$^{th}$: box and 5$^{th}$ and 95$^{th}$ percentiles: whisker). Significant ($p<0.01$) differences indicated by squares at top of panel.