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New constraints on biogenic emissions using satellite-based estimates of carbon monoxide fluxes

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1 Seasonality of biogenic CO fluxes in selected regions of interest.

1.1 Equatorial Africa. Equatorial Africa is characterized more by dense moist forests as compared to the shrub and grass land cover dominating the N. African Savanna region. Figure S1 shows the same map as the inset map in Figure 2, but with the Equatorial Africa region highlighted. Similarly, Figures S2 and S3 show the monthly variability of posterior biogenic CO fluxes as compared to BB and FF (Fig S2) and as compared to the BIRA/OMI isoprene estimates and MERRA surface air temperature (Fig. S3)

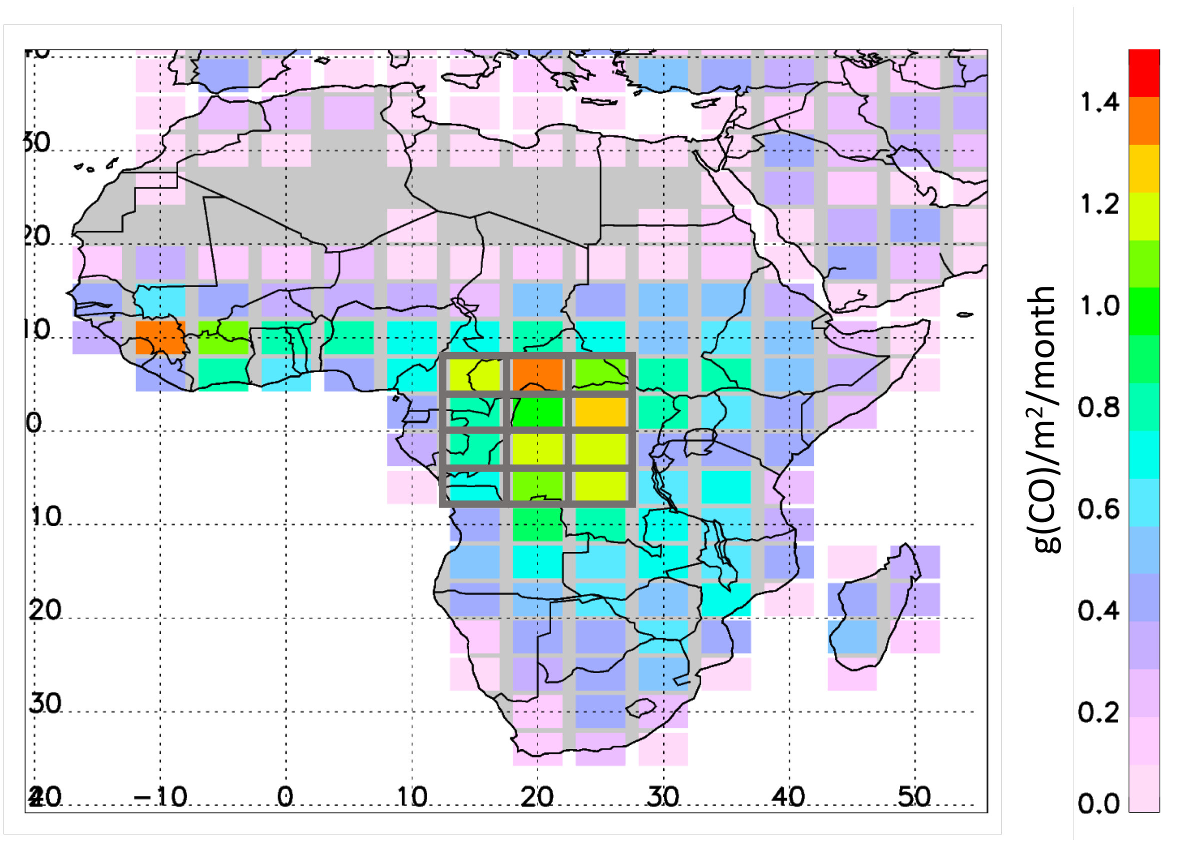

Figure S1. Map of a posteriori biogenic CO fluxes. Grey boxes indicate the Equatorial Africa region used for the 2005-2012 average computed for each month.

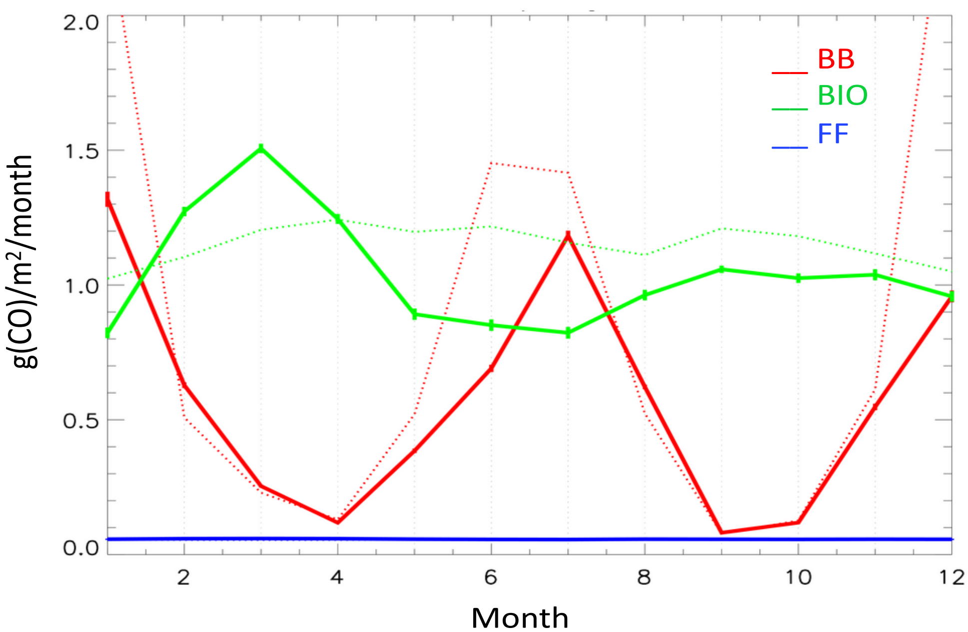

Figure S2. A posteriori (solid lines) and a priori (dotted lines) CO fluxes averaged for each month over 2005-2012 for the Equatorial Africa (Fig. S1) region for biomass burning (BB, red), biogenic (BG, green) and fossil fuel (FF, blue) sectors. Errors on the 8-yr average fluxes for this region are indicated for each sector and month, with values around 1.8% for BIO, 1.9% for BB and 4.2% for FF.

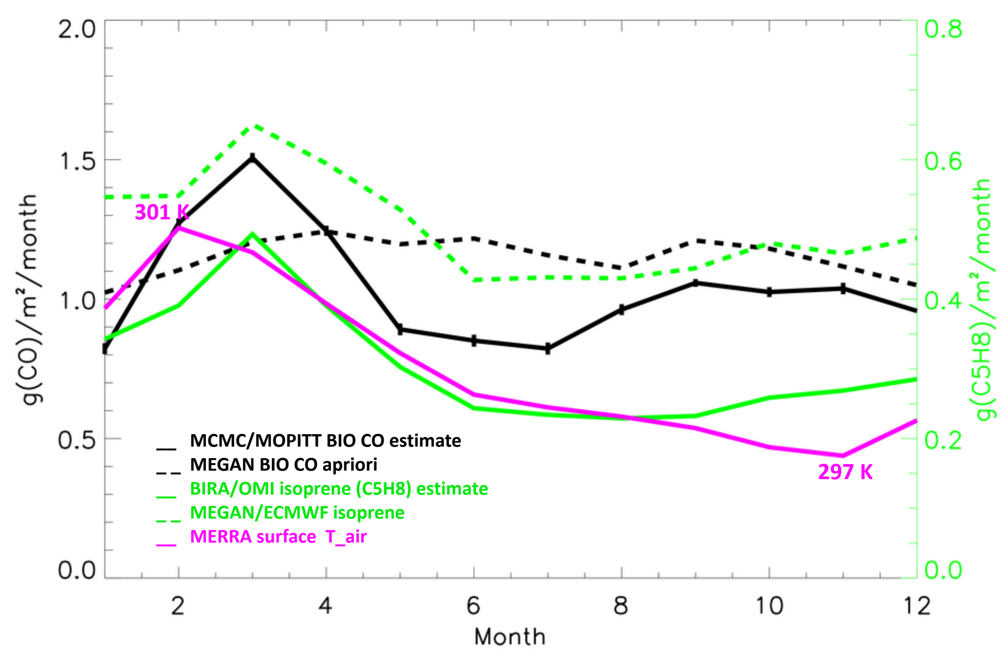

Figure S3. Average monthly CO (black) and C5H8 (green) fluxes and surface air temperatures (magenta, with minimum and maximum values indicated) for 2005-2012 for the Equatorial Africa region (Fig. S1). Solid black and green lines show the posterior "top-down" fluxes while dashed black and green lines show the emissions predicted by MEGAN with associated meteorological fields.

1.2 South American Amazon. This region includes lowlands with moist forests and savannas. Figure S4 shows posterior biogenic CO fluxes for S. America (same color scale as Fig. 1) with the Amazon region of interest highlighted. Similar to the African regions, Figures S5 and S6 show the monthly variability of posterior biogenic CO fluxes as compared to BB and FF (Fig S5) and as compared to the BIRA/OMI isoprene estimates and MERRA surface air temperature (Fig. S6)

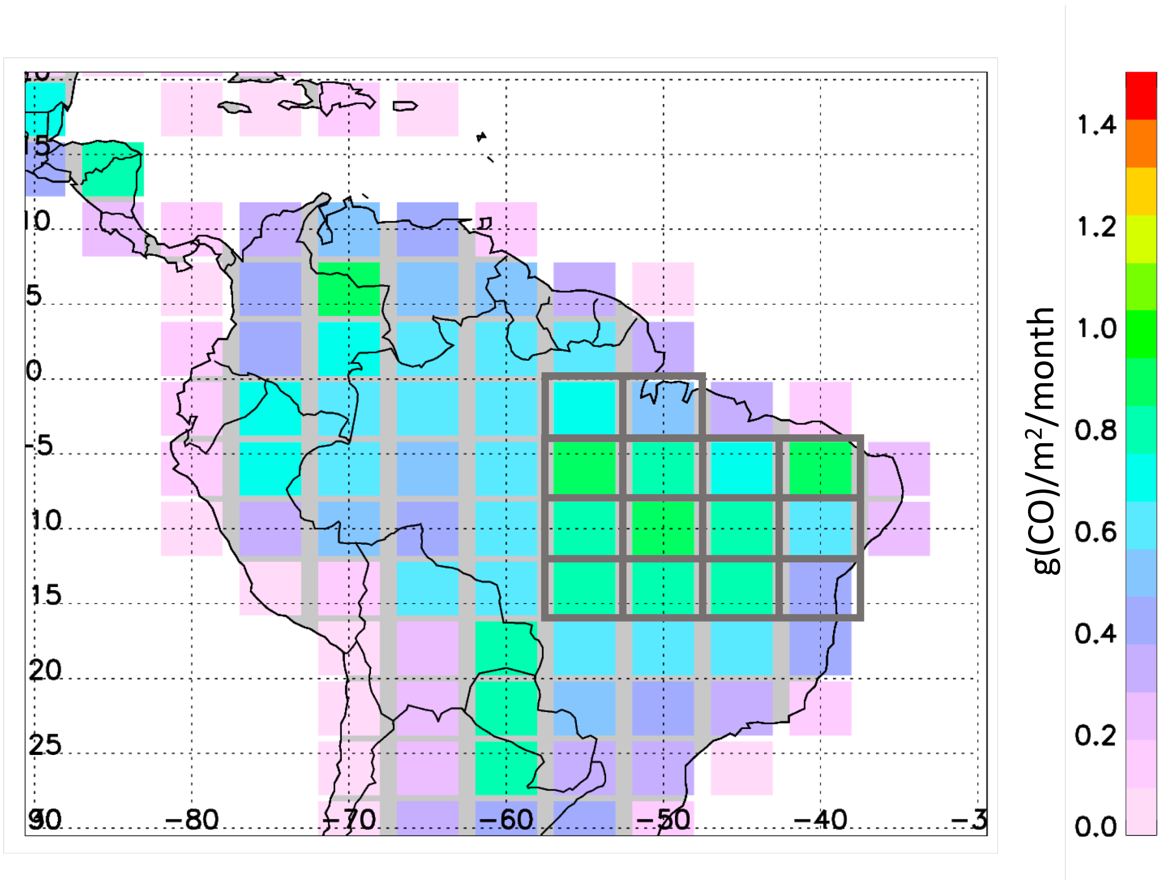

Figure S4. Map of a posteriori biogenic CO fluxes. Grey boxes indicate the S. American Amazon region used for the 2005-2012 average computed for each month.

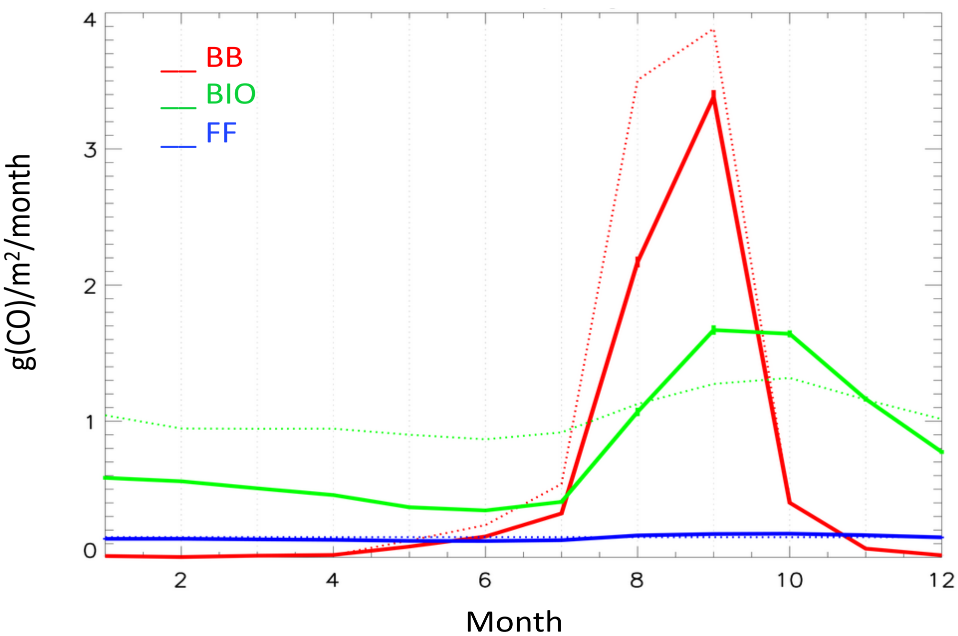

Figure S5. A posteriori (solid lines) and a priori (dotted lines) CO fluxes averaged for each month over 2005-2012 for the S. American Amazon (Fig. S4) region for biomass burning (BB, red), biogenic (BG, green) and fossil fuel (FF, blue) sectors. Errors on the 8-yr average fluxes for this region are indicated for each sector and month, with values around 2.2% for BIO, 1.7% for BB and 4.2% for FF.

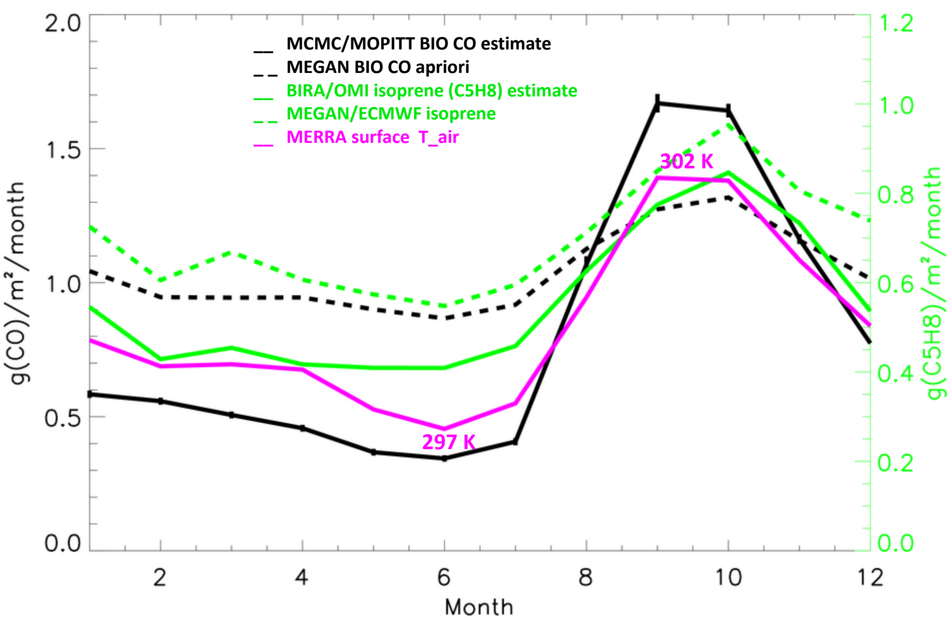

Figure S6. Average monthly CO (black) and C5H8 (green) fluxes and surface air temperatures (magenta, with minimum and maximum values indicated) for 2005-2012 for the S. America Amazon region (Fig. S4). Solid black and green lines show the posterior "top-down" fluxes while dashed black and green lines show the emissions predicted by MEGAN with associated meteorological fields.

1.3 South American Tropical Andes Piedmont. This region is characterized mainly by plains and humid forests. Figure S7 shows posterior biogenic CO fluxes for S. America (same color scale as Fig. 1) with the tropical Andes piedmont region of interest highlighted. Similar to the African regions, Figures S8 and S9 show the monthly variability of posterior biogenic CO fluxes as compared to BB and FF (Fig S8) and as compared to the BIRA/OMI isoprene estimates and MERRA surface air temperature (Fig. S9)

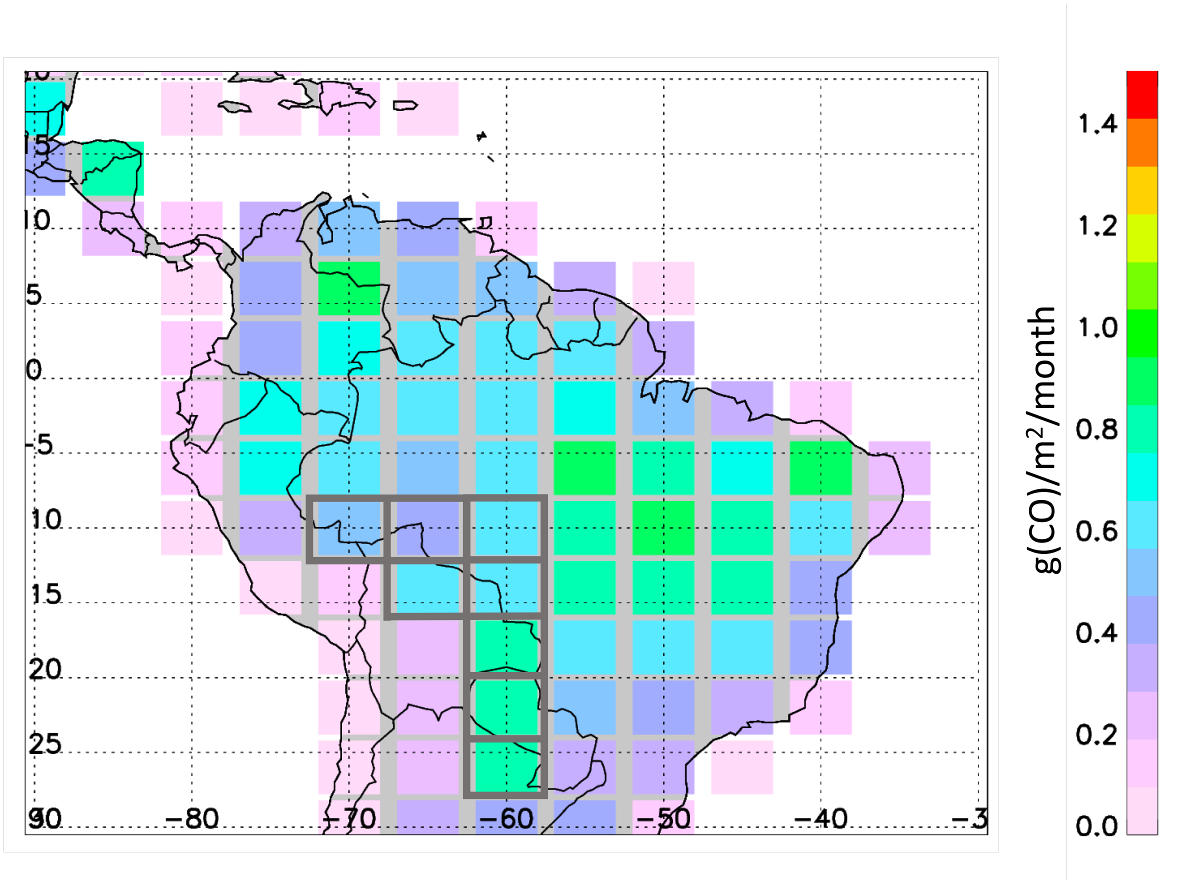

Figure S7. Map of a posteriori biogenic CO fluxes. Grey boxes indicate the S. American tropical Andes piedmont region used for the 2005-2012 average computed for each month.

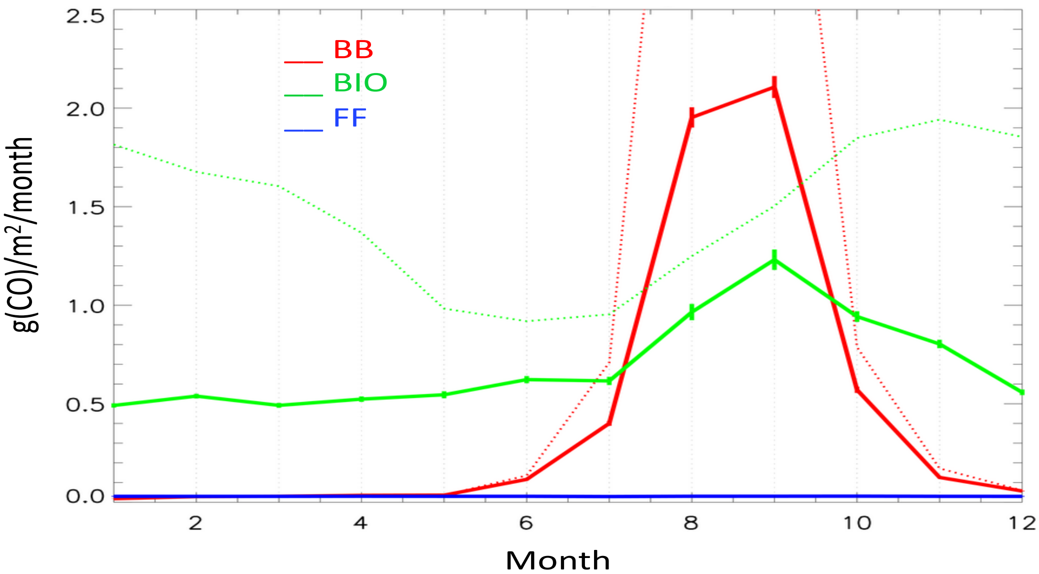

Figure S8. A posteriori (solid lines) and a priori (dotted lines) CO fluxes averaged for each month over 2005-2012 for the S. American tropical Andes piedmont (Fig. S7) region for biomass burning (BB, red), biogenic (BIO, green) and fossil fuel (FF, blue) sectors. Errors on the 8-yr average fluxes for this region are indicated for each sector and month, with values around 3.1% for BIO, 2.7% for BB and 5.7% for FF.

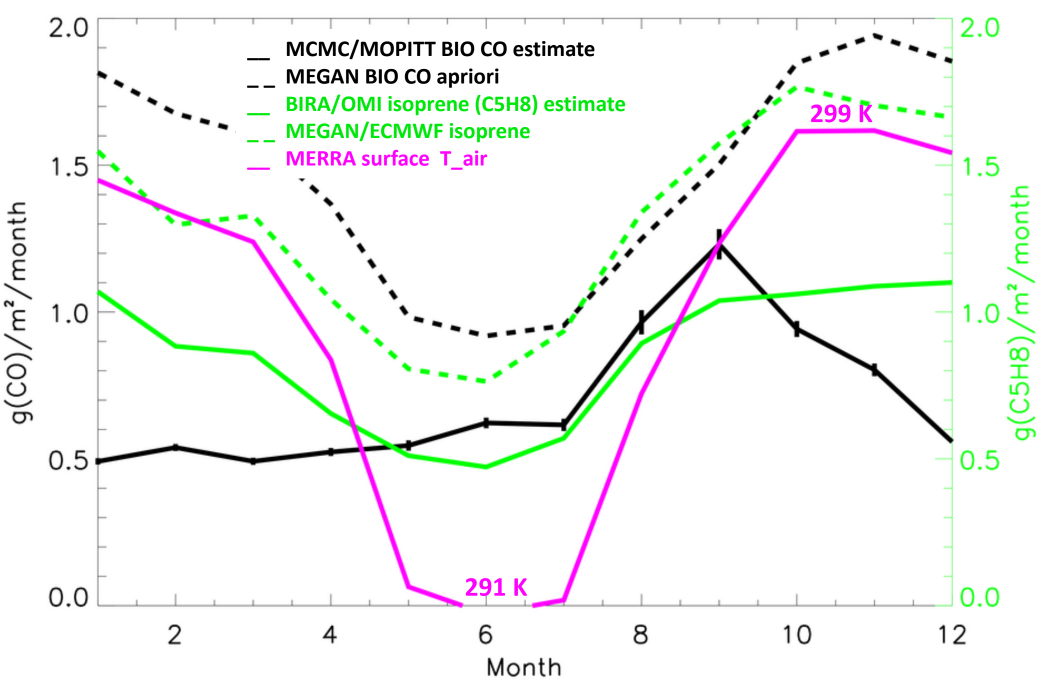

Figure S9. Average monthly CO (black) and C5H8 (green) fluxes and surface air temperatures (magenta, with minimum and maximum values indicated) for 2005-2012 for the S. America tropical Andes piedmont region (Fig. S7). Solid black and green lines show the posterior "top-down" fluxes while dashed black and green lines show the emissions predicted by MEGAN with associated meteorological fields.

1.4 Australian Tropics and Subtropics. This region includes both humid and dry eucalypt forests. Figure S10 shows posterior biogenic CO fluxes for S. America (same color scale as Fig. 1) with the tropical Andes piedmont region of interest highlighted. Similar to the African regions, Figures S11 and S12 show the monthly variability of posterior biogenic CO fluxes as compared to BB and FF (Fig S11) and as compared to the BIRA/OMI isoprene estimates and MERRA surface air temperature (Fig. S12)

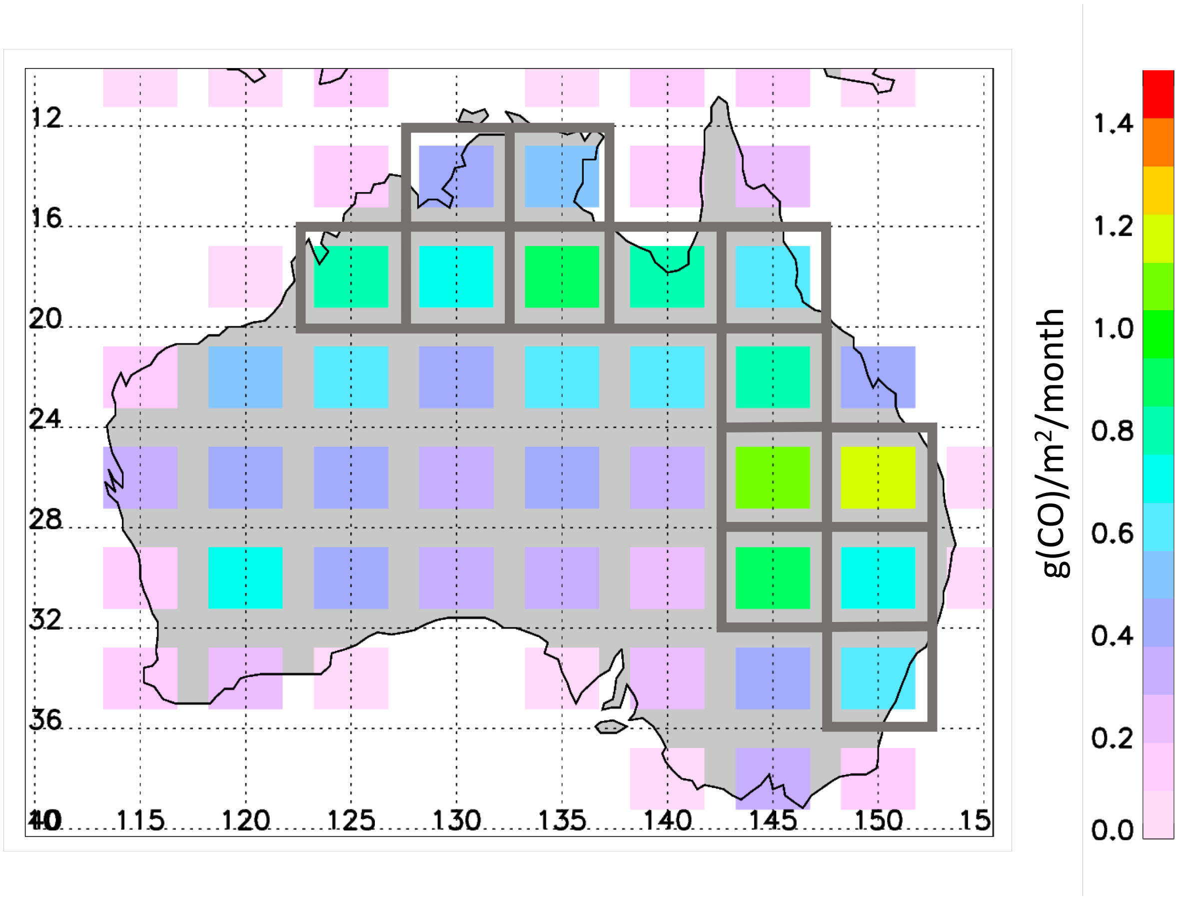

Figure S10. Map of a posteriori biogenic CO fluxes. Grey boxes indicate the Australian regions used for the 2005-2012 average computed for each month.

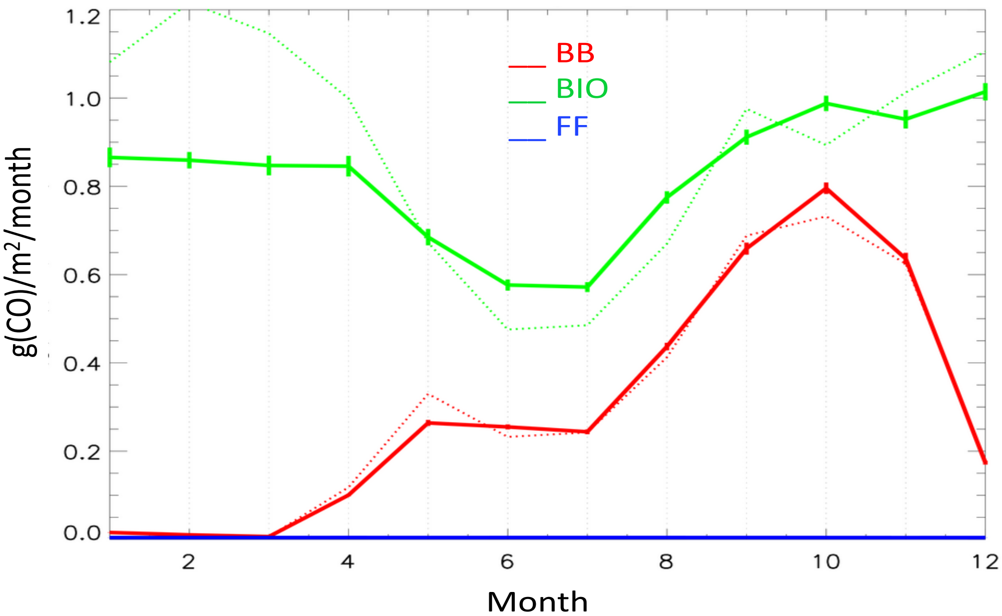

Figure S11. A posteriori (solid lines) and a priori (dotted lines) CO fluxes averaged for each month over 2005-2012 for the Australian tropics and subtropics region (Fig. S10) for biomass burning (BB, red), biogenic (BG, green) and fossil fuel (FF, blue) sectors. Errors on the 8-yr average fluxes for this region are indicated for each sector and month, with values around 2.2% for BIO, 2.1% for BB and 4.4% for FF.

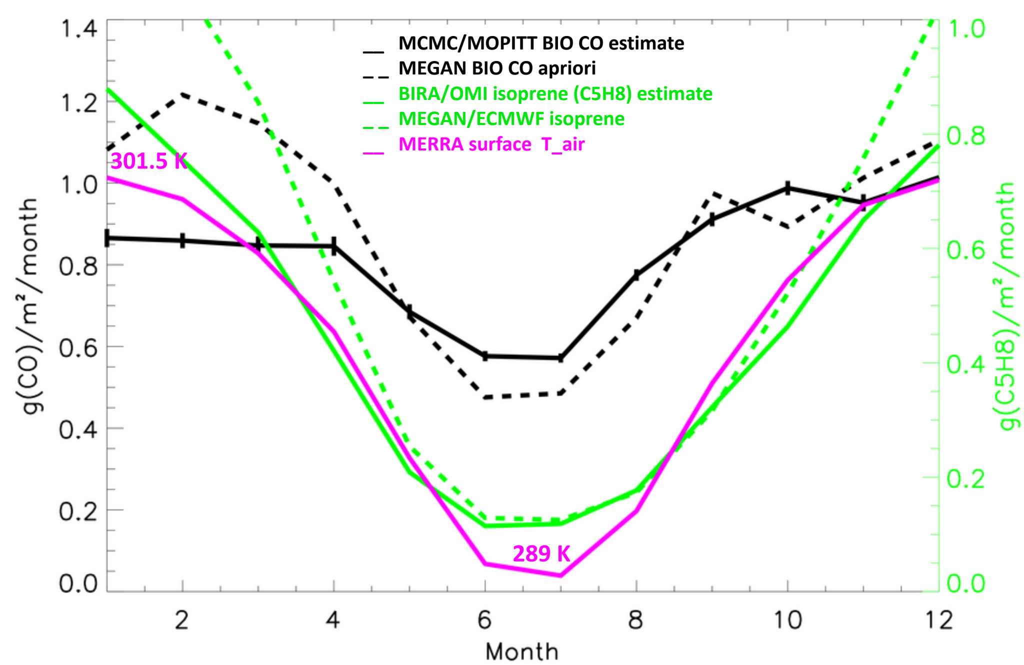

Figure S12. Average monthly CO (black) and C5H8 (green) fluxes and surface air temperatures (magenta, with minimum and maximum values indicated) for 2005-2012 for the Australian tropics and subtropics region (Fig. S10). Solid black and green lines show the posterior “top-down” fluxes while dashed black and green lines show the emissions predicted by MEGAN with associated meteorological fields.