JOURNAL OF GEOPHYSICAL RESEARCH

Supporting Information for "Enhanced net CO_2 exchange of a semi-deciduous forest in the southern Amazon due to diffuse radiation from biomass burning"

S. N. R. Silva[1], G. G. Cirino[2,1,5], D. S. Moreira[3], R. S. Palácios[2,5], M. I. Vitorino[1,2], and G. L. Vourlitis[4]

[1]Programa de Pós-Graduação em Ciências Ambientais, Universidade Federal do Pará, Belém-PA, Brazil

[2]Instituto de Geociências, Faculdade de Meteorologia, Universidade Federal do Pará, Belém-PA, Brazil

[3]Faculdade de Ciências, Universidade Estadual Paulista, Bauru-SP, Brazil

[4]Department of Biological Sciences, California State University, San Marcos, CA, USA

[5]Programa de Pós-Graduação em Gestão de Risco e Desastre na Amazônia, Universidade Federal do Pará, Belém-PA, Brazil

Contents of this file

Corresponding author: G. L. Vourlitis, Department of Biological Sciences, California State University, San Marcos, CA, USA (georgev@csusm.edu)

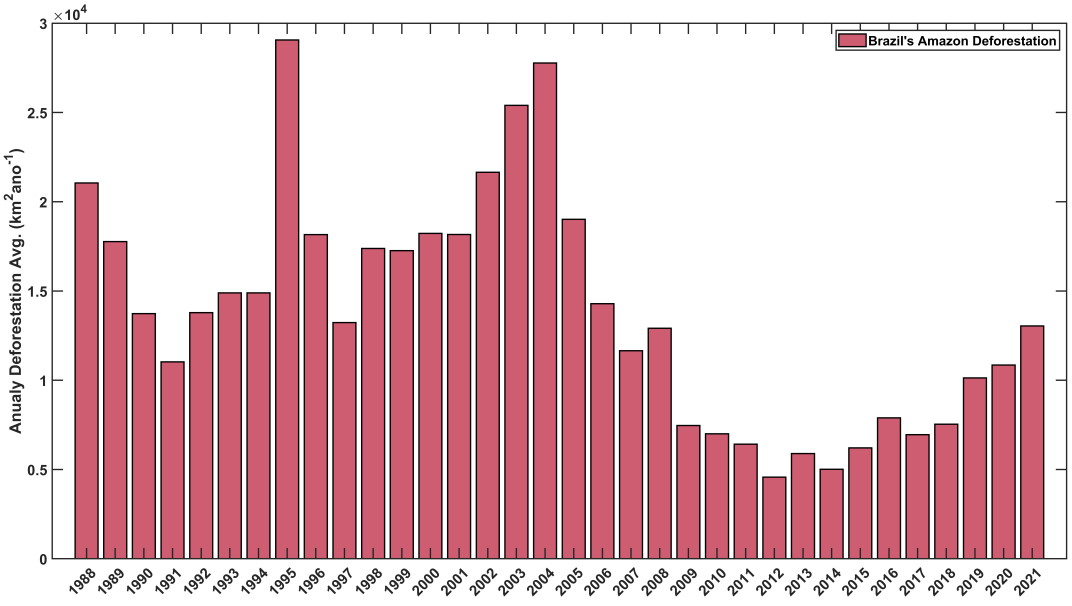

Figure S1. Time series of clear-cut deforestation in the Legal Amazon (1988 to 2021). Data originated from the PRODES project. The data were collected at the website from The National Institute for Space Research (INPE), link below (Table S3).

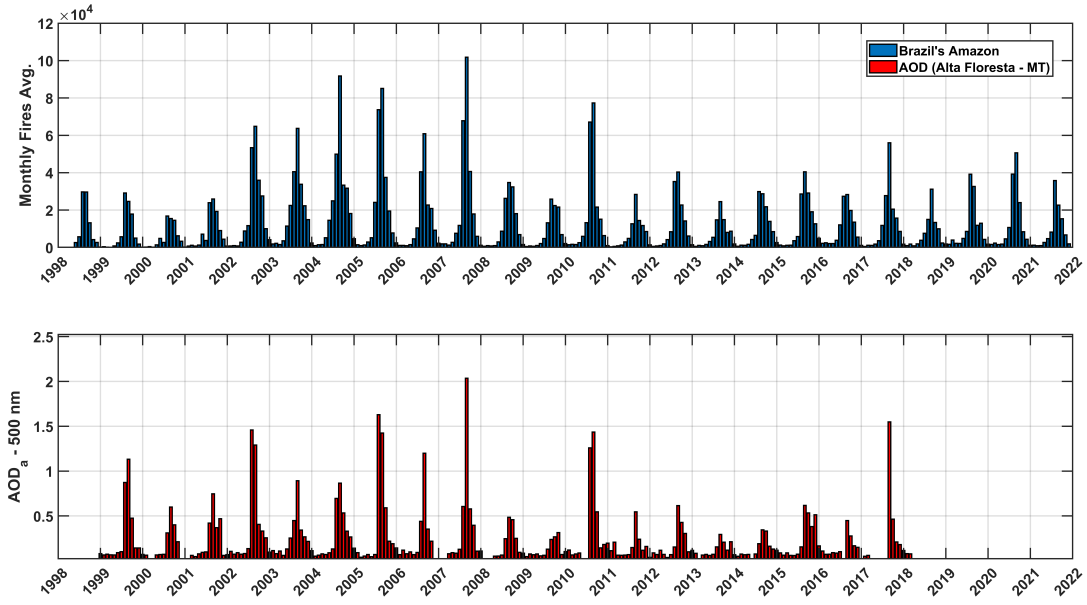

Figure S2. Shows the time series of fires in the Legal Amazon from 1998 to 2022 (top panel). Data originated from the PRODES project (link above mentioned). In the image below (bottom panel), we show the time series of aerosol optical depth for the Legal Amazon (1999 to 2018) originated from two remote sensors: MODIS from the AQUA and TERRA satellites and from the AERONET solar photometer (on the ground). All these remote measurements are managed by NASA, link below (Table S3).

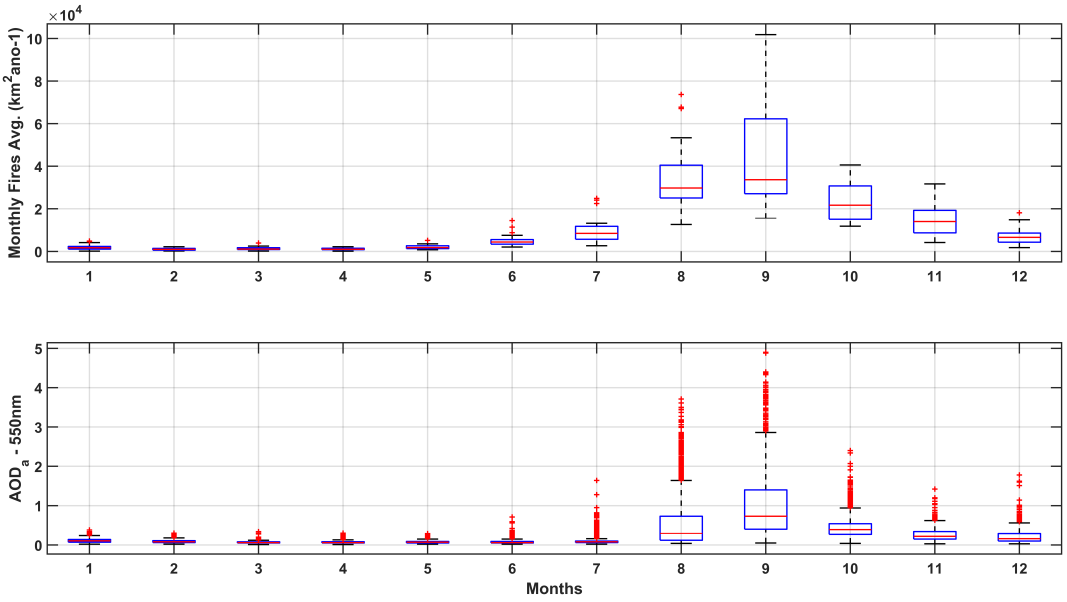

Figure S3. In the image above, the boxplot shows the statistical behavior of the time series of monthly data on fires that occurred in the Legal Amazon (1998 to 2022), observing the expressive seasonality during months August to November with a high peak of occurrence during months September. In the image below, the AOD boxplot tracks the fire behavior for the same period, link below (Table S3).

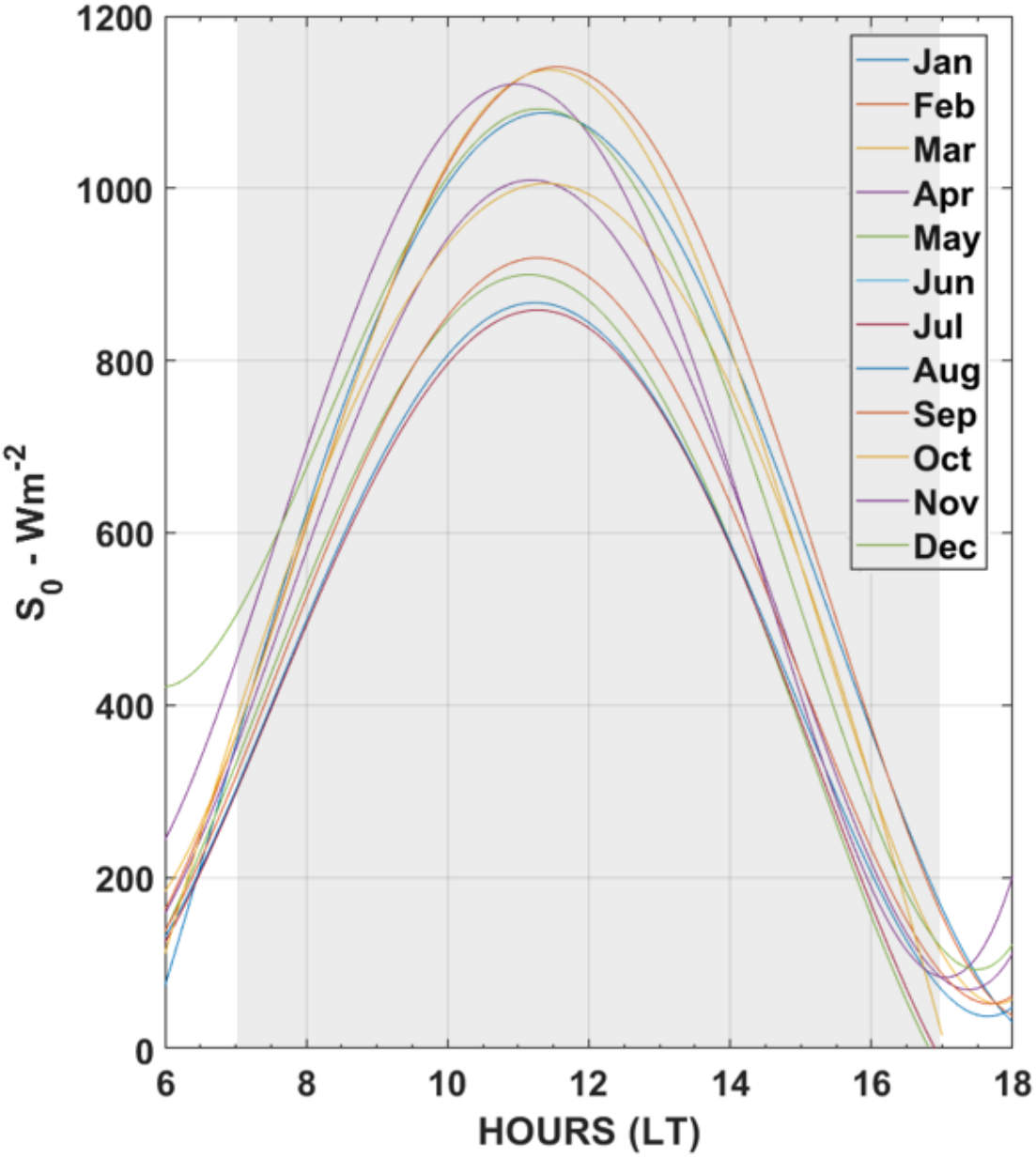

Figure S4. Curves containing the average hourly behavior (monthly) of incident solar radiation values measured by AERONET in Alta Floresta-MT. The analyzed hourly values are between 07h and 17h (LT) for the period from July 2005 to June 2008. We excluded from the data set all the values before 07h (LT) and after 17h (LT). Only the daylight hours are considered.

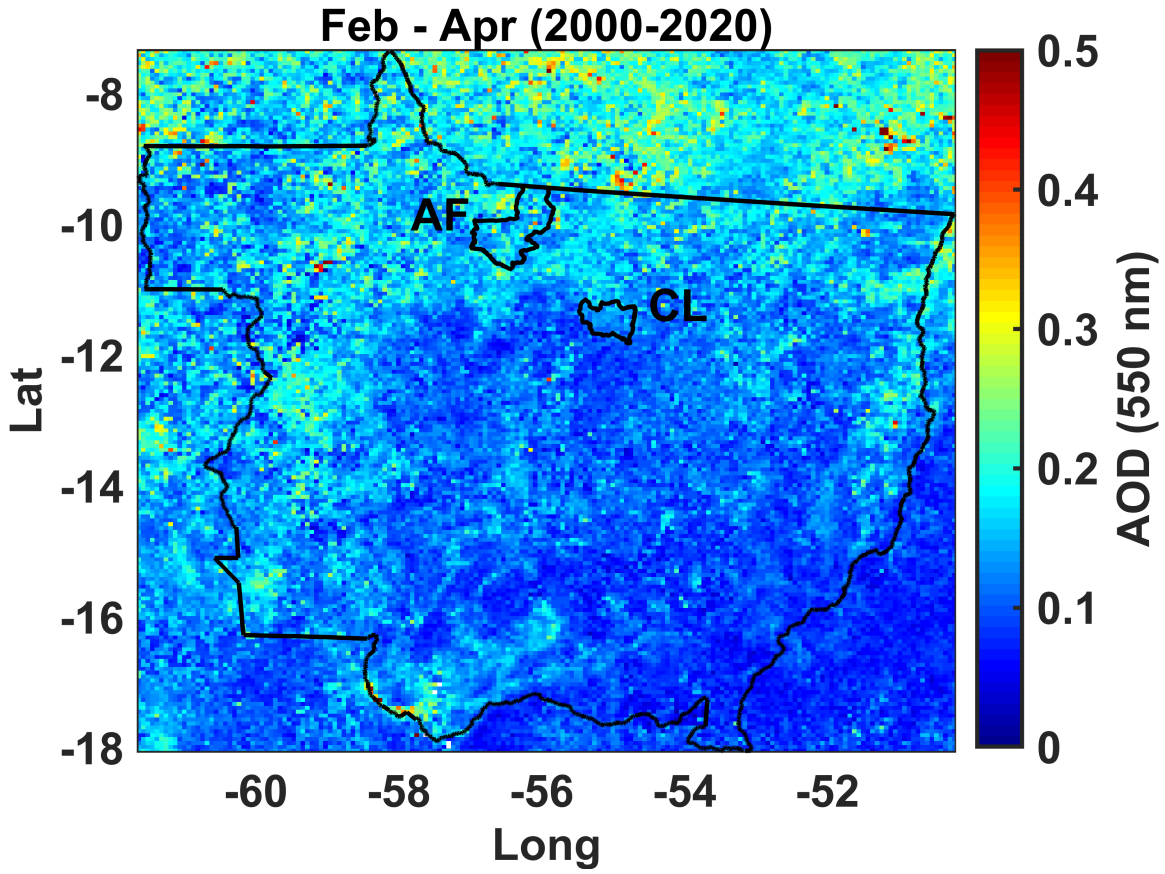

Figure S5. Spatial behavior of aerosol optical depth (AOD) over the State of Mato Grosso (intense area of the arc of deforestation). In the image above is the behavior of AOD during the wet season (February to April) for the data period from 2000 to 2020, obtained from the AQUA and TERRA Satellites (Table S3).

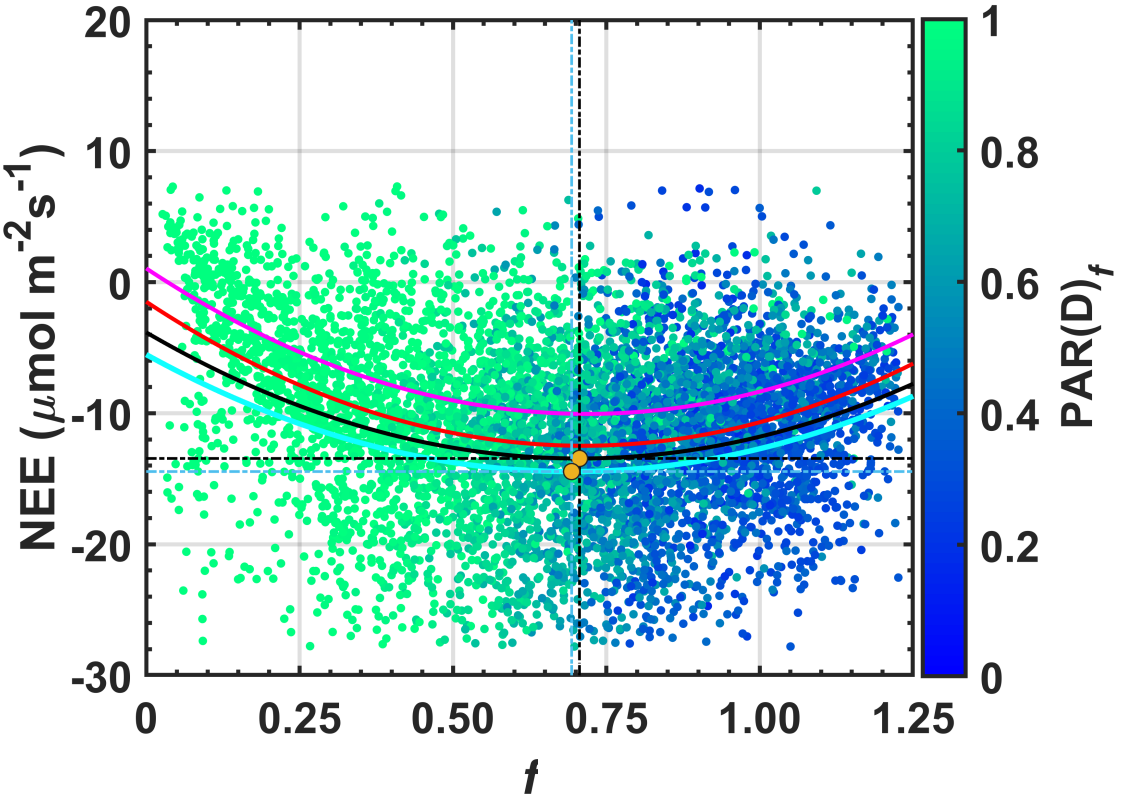

Figure S6. Variability of NEE for various SZA ranges, respectively equal to 0-20 (magenta), 20-40 (black), 40-60 (cyan), and 0-60 (red) degrees, in the semi-deciduous forest in the Claudia municipality, 50 km northeast of Sinop-MT (2005-2008). These graphs include the effects of aerosols in the experimental area.

Table S1. Coefficients of the fitted curves of the average hourly (monthly) data of incident solar radiation values measured by AERONET in Alta Floresta-MT. The analyzed hourly values are between 07h and 17h (LT) for the period from July 2005 to June 2008.

4th degree polynomial curves					
Months	$p1$	$p2$	$p3$	$p4$	$p5$
January	$+0.38$	-17	$+2.4 \times 10^2$	-1.1×10^3	$+1.2 \times 10^3$
February	$+0.57$	-26	$+4.1 \times 10^2$	-2.4×10^3	$+4.7 \times 10^3$
March	$+0.69$	-32	$+4.9 \times 10^2$	-3.0×10^3	$+6.2 \times 10^3$
April	$+0.64$	-29	$+4.3 \times 10^2$	-2.5×10^3	$+5.0 \times 10^3$
May	$+0.44$	-20	$+2.9 \times 10^2$	-1.6×10^3	$+2.8 \times 10^3$
June	$+0.43$	-20	$+3.0 \times 10^2$	-1.7×10^3	$+3.1 \times 10^3$
July	$+0.49$	-22	$+3.3 \times 10^2$	-1.9×10^3	$+3.6 \times 10^3$
August	$+0.51$	-23	$+3.5 \times 10^2$	-2.0×10^3	$+3.8 \times 10^3$
September	$+0.15$	-07	$+8.8 \times 10^1$	-1.4×10^2	-8.7×10^2
October	$+0.77$	-34	$+5.1 \times 10^2$	-2.9×10^3	$+5.8 \times 10^3$
November	$+0.74$	-35	$+5.5 \times 10^2$	-3.5×10^3	$+8.1 \times 10^3$
December	-0.42	$+24$	-5.1×10^2	$+4.9 \times 10^3$	-1.6×10^4

Table S2. Polynomial adjustments, coefficients, and statistics for the morning and afternoon periods between (07-17h) in the micrometeorological tower 50 km from Sinop-MT, in the municipality of Cláudia-MT, between 2005-2008.

Settings	**Angles**	**Coeficientes**			**Statistic**
Poly fit 2nd	SZA	a	b	c	Cp (x_v,y_v)
NEE	0-20°	$+19$	-26	-5.5	$(0.68, -14.39)$
	20-40°	$+19$	-27	-3.8	$(0.71, -13.39)$
	40-60°	$+21$	-31	$+1.0$	$(0.73, -10.44)$
	0-60°	$+22$	-31	-1.5	$(0.70, -12.42)$

Table S3. List with hyperlinks and Digital Object Identifiers (DOI) of all figures and tables used in this publication.

Open Research - Data Availability Statement				
Secondary Data	**Cloud-based Repository**	**Hyperlink**	**DOI**	**WebPage**
Remote Sensing (Satellites)	Terra-Aqua	Laads Daac	–	NASA Laads Daac
Remote Sensing (Ground)	Aeronet (Lev.2.0)	Goddard-Sfc	–	NASA Goddard
Short Wave Radiation	Aeronet (Lev.1.5)	Goddard-Sfc	–	NASA Goddard
Deforestation and fires	Prodes	Terra-Brasilis	–	INPE Prodes
Weather forecasts Models	Sol-Calculator	Solar-Calc	–	Meteo Exploration
Primary Data	**Cloud-based Repository**	**Hyperlink**	**DOI**	**Managers**
Eddy Flux (CO_2)	Mendeley Data	Brazil-EFlux-Stf	10.17632/m5h5fw872g.1	Cirino, G. et al. (2022)
Net Ecosystem Exchange (NEE)	Mendeley Data	Brazil-NFlux-Stf	10.17632/m5h5fw872g.1	Cirino, G. et al. (2022)
Meteorological Data	Mendeley Data	Brazil-AWsta-Stf	10.17632/m5h5fw872g.1	Cirino, G. et al. (2022)