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Using geostationary-satellite-derived sub-daily fire radiative power variability versus prescribed diurnal cycles to assess the impact of African fires on tropospheric ozone

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Table S1. Spatial correlation and mean bias (in the brackets) between observations and simulations (unit: DU for CO and O_3, and 10^{16} molecules cm^{-2} for NO_2).

	Month	GFED4_3hourly	GFAS_daily	FREM_hourly	FREM_3hourly	FREM_daily
CO	Jan	0.91 (1.47)	0.89 (0.13)	0.90 (2.10)	0.90 (2.11)	0.90 (2.11)
	Apr	0.92 (-3.92)	0.92 (-3.41)	0.92 (-3.86)	0.92 (-3.87)	0.92 (-3.89)
	Jul	0.95 (5.97)	0.90 (1.56)	0.94 (6.41)	0.94 (6.32)	0.93 (6.25)
	Oct	0.58 (5.42)	0.52 (5.34)	0.49 (4.82)	0.49 (4.81)	0.49 (4.82)
NO_2	Jan	0.79 (0.04)	0.82 (0.01)	0.81 (0.02)	0.81 (0.02)	0.79 (0.03)
	Apr	0.84 (0.01)	0.84 (0.01)	0.83 (0.01)	0.83 (0.01)	0.83 (0.01)
	Jul	0.87 (0.08)	0.90 (0.02)	0.89 (0.06)	0.90 (0.05)	0.89 (0.05)
	Oct	0.78 (0.01)	0.82 (-0.0004)	0.84 (-0.002)	0.84 (-0.003)	0.83 (-0.002)
TROPOMI O_3	Jan	0.54 (-1.05)	0.62 (-2.84)	0.60 (-0.50)	0.60 (-0.50)	0.60 (-0.53)
	Apr	-0.28 (-4.33)	-0.28 (-4.55)	-0.29 (-1.59)	-0.29 (-1.58)	-0.29 (-1.58)
	Jul	-0.03 (1.71)	-0.10 (-0.59)	-0.07 (0.04)	-0.07 (0.06)	-0.06 (0.04)
	Oct	0.80 (-2.44)	0.77 (-3.01)	0.78 (-1.84)	0.78 (-1.84)	0.78 (-1.86)
OMI O_3	Jan	0.77 (9.17)	0.81 (7.92)	0.80 (8.13)	0.80 (8.15)	0.80 (8.15)
	Apr	0.87 (3.10)	0.88 (2.93)	0.87 (2.89)	0.87 (2.90)	0.87 (2.89)
	Jul	0.72 (4.14)	0.85 (2.81)	0.84 (3.02)	0.83 (3.03)	0.83 (3.03)
	Oct	0.92 (2.26)	0.93 (1.86)	0.94 (1.78)	0.94 (1.79)	0.94 (1.78)

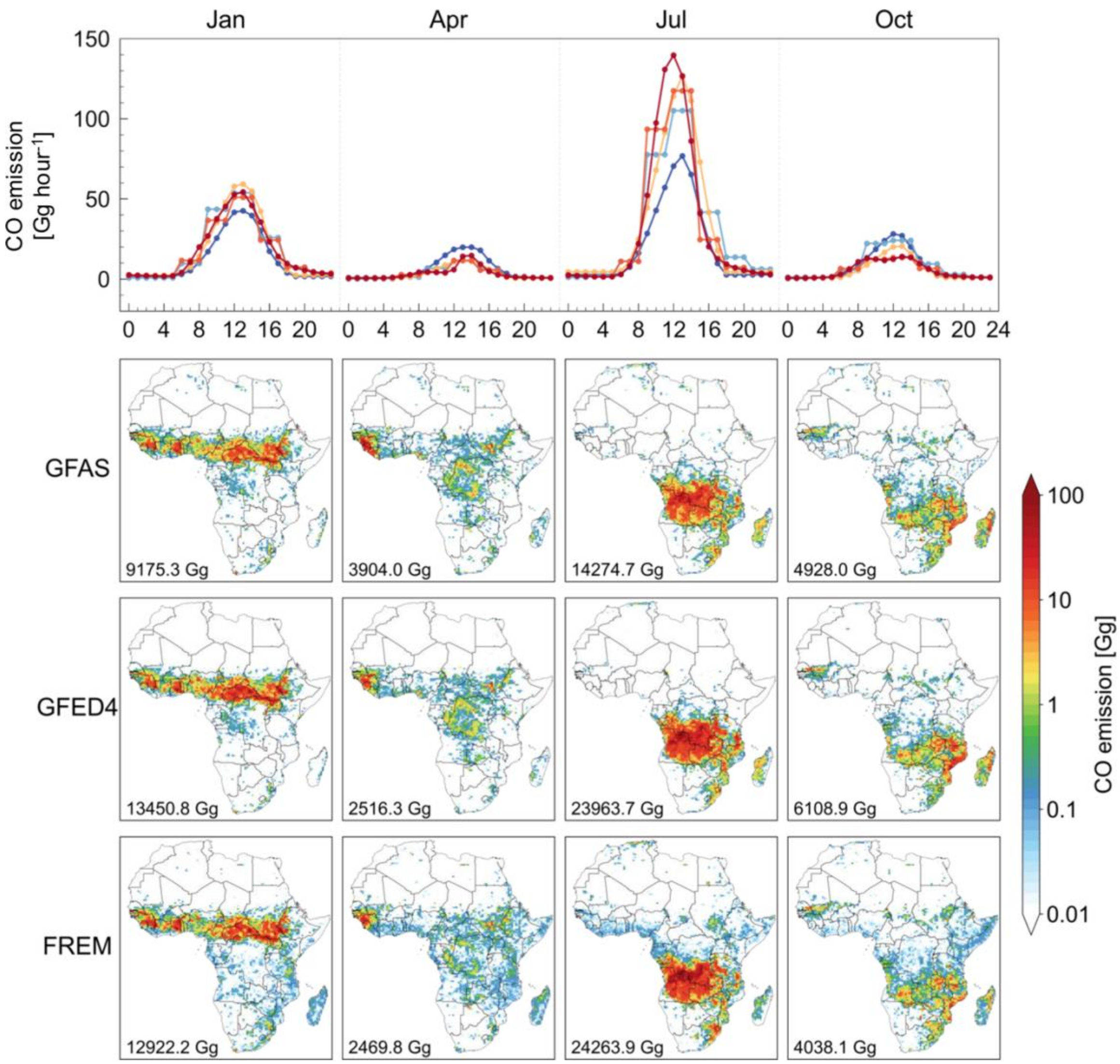

Figure S1. Same with Figure 1, but for BB CO emissions.

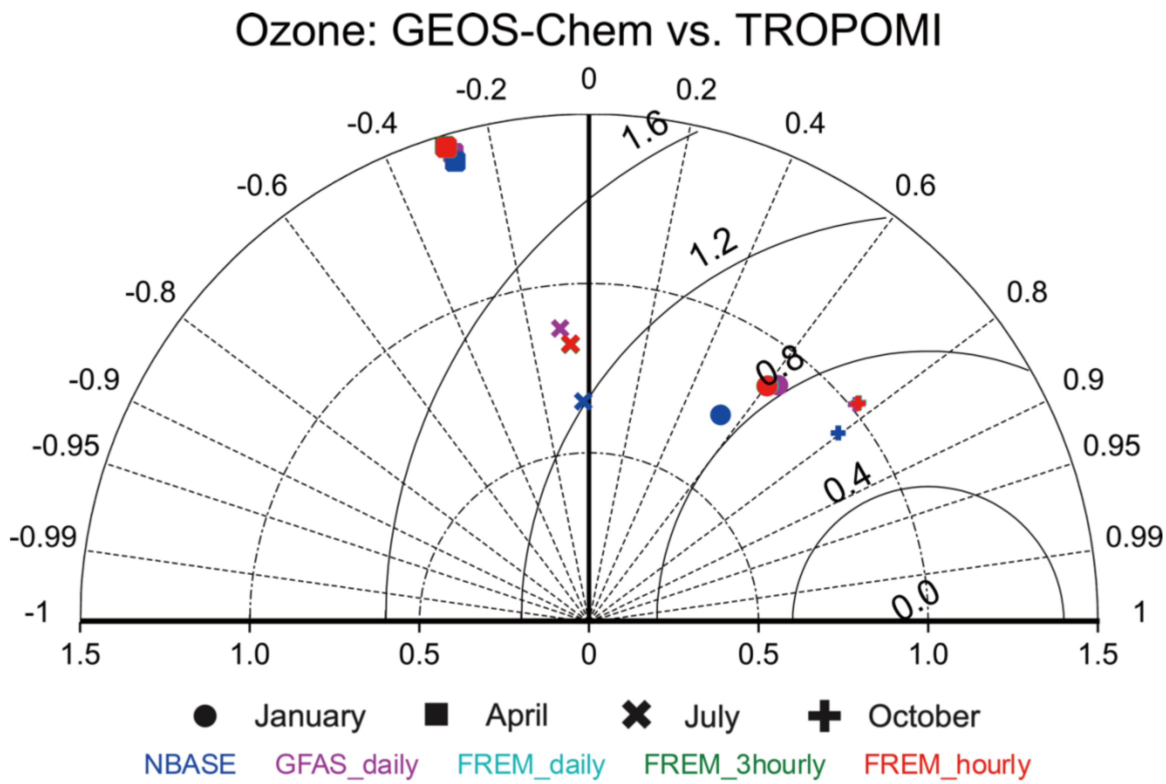

Figure S2. Same with Figure 2, but for TROPOMI tropospheric ozone column.

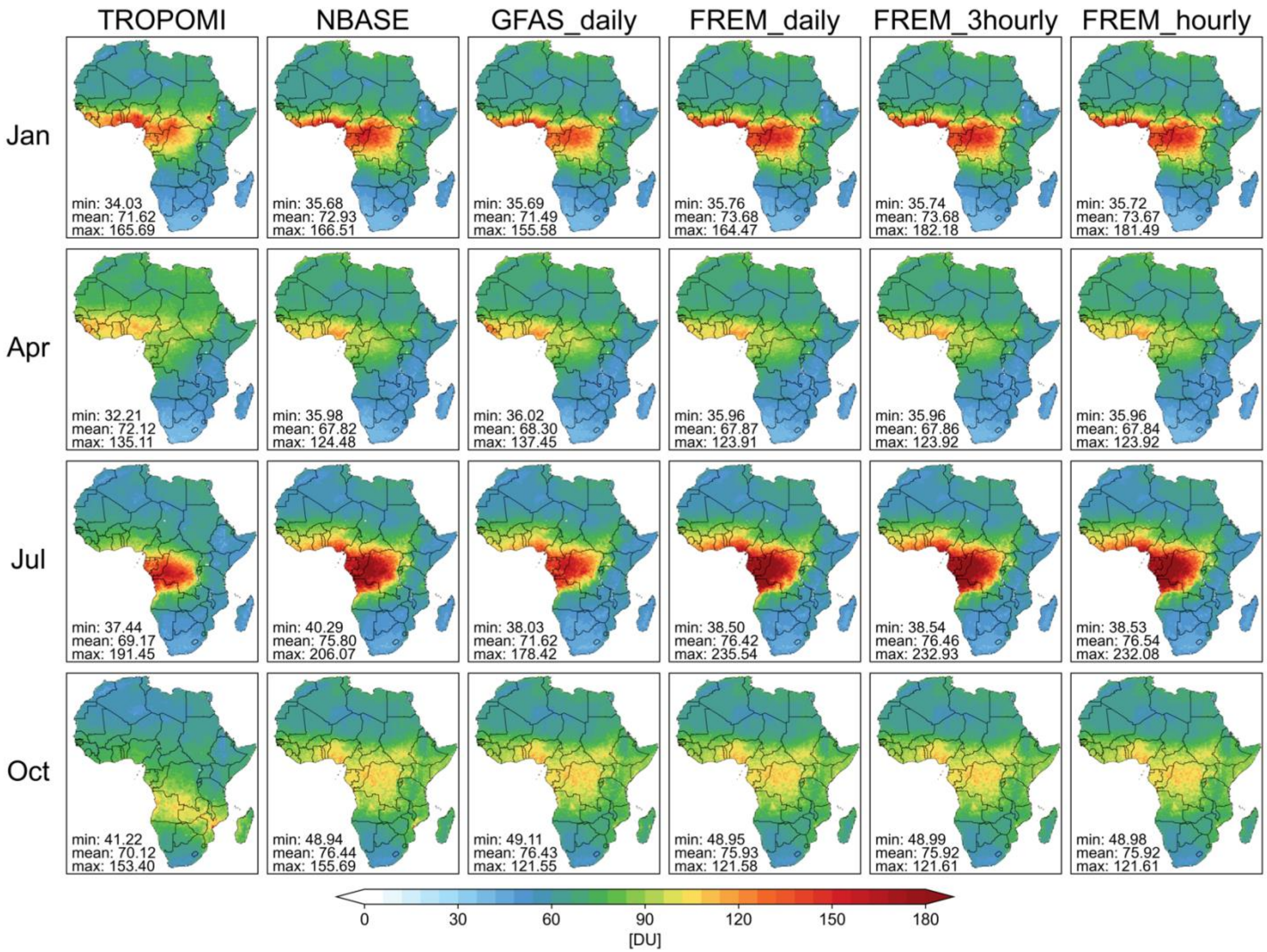

Figure S3. Comparison of TROPOMI CO total column with modelled results with different biomass burning emission inventories.

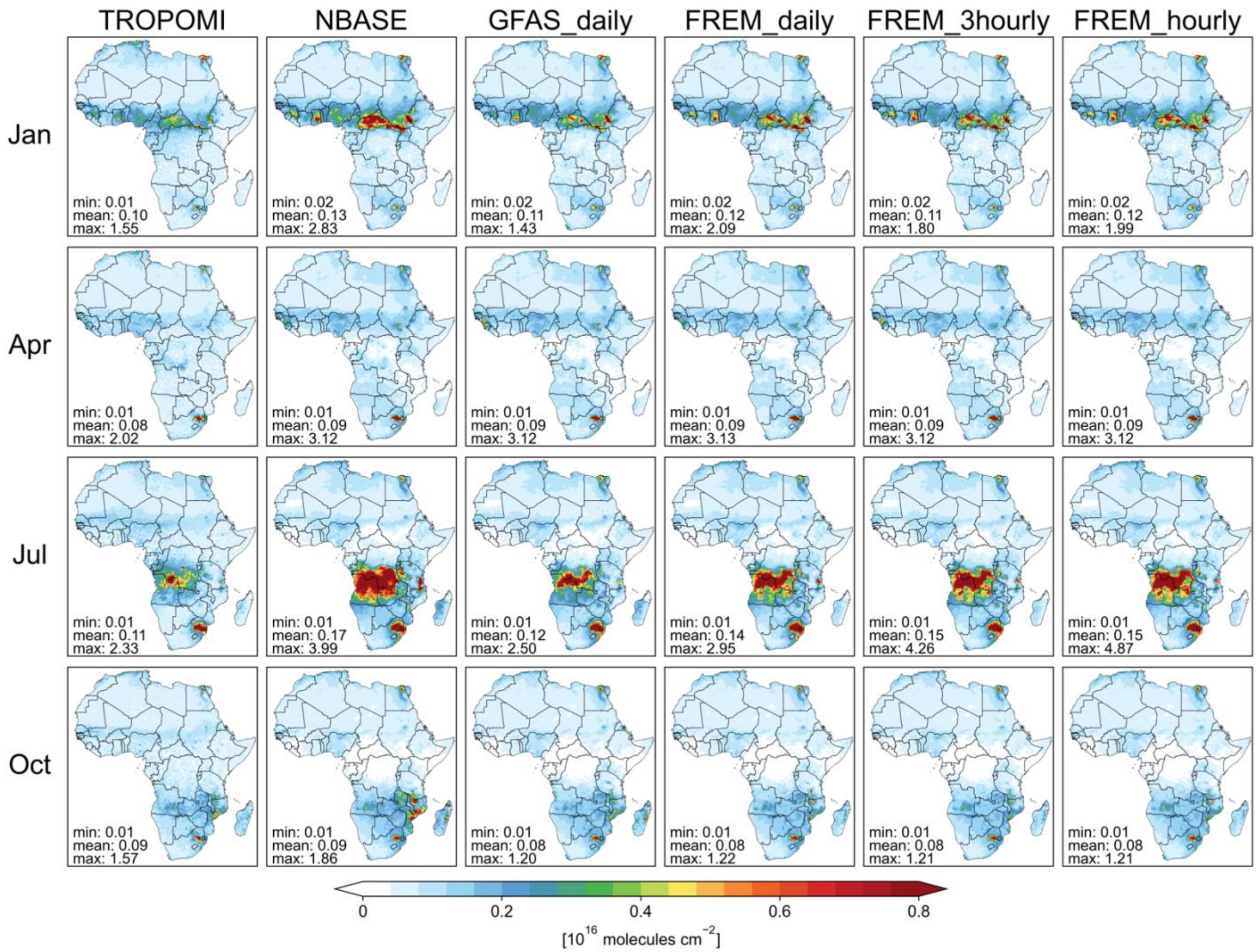

Figure S4. Same with Figure S2, but for tropospheric NO_2 column.

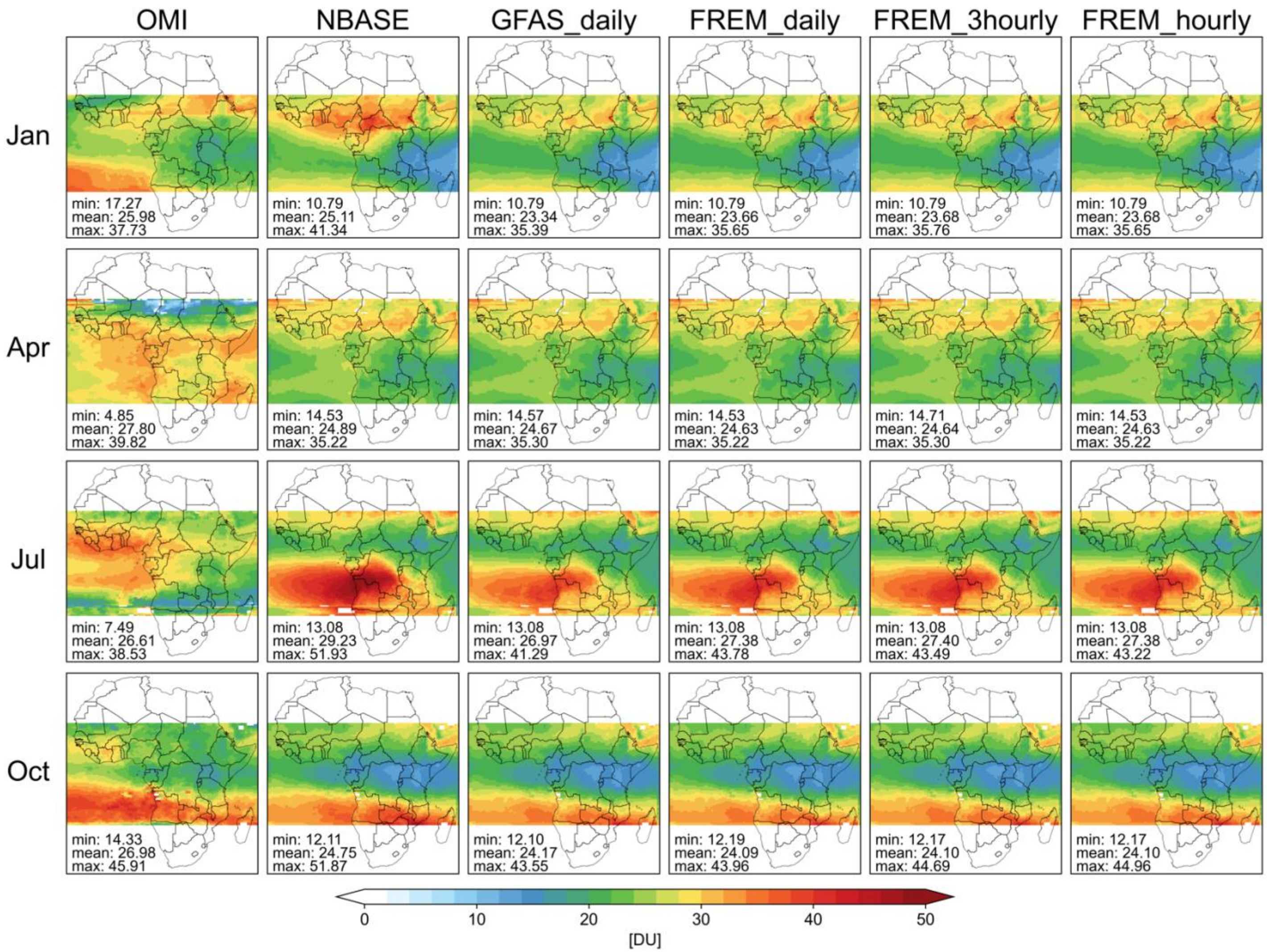

Figure S5. Same with Figure S2, but for TROPOMI tropospheric ozone column.

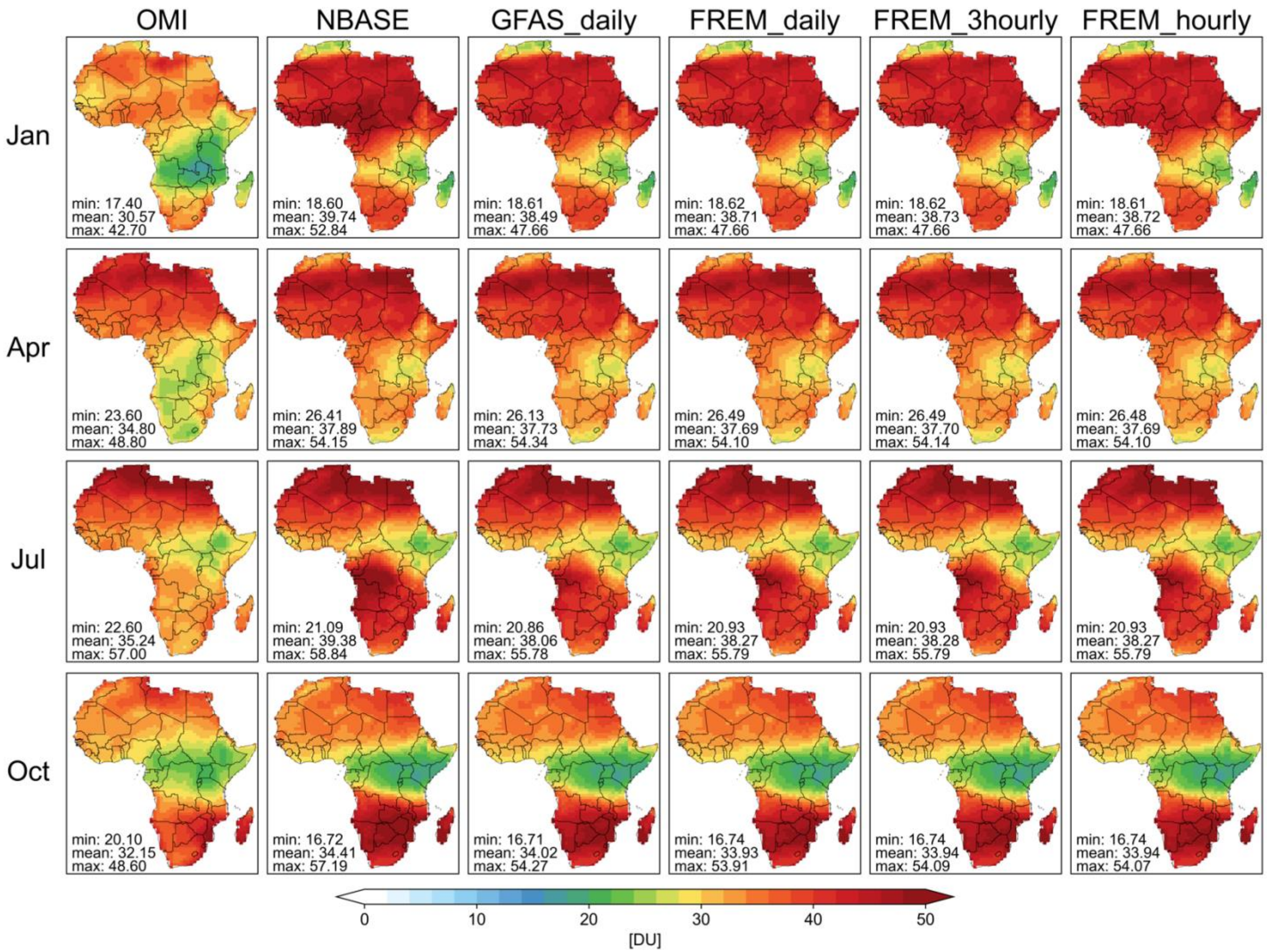

Figure S6. Same with Figure S4, but for OMI tropospheric ozone column.

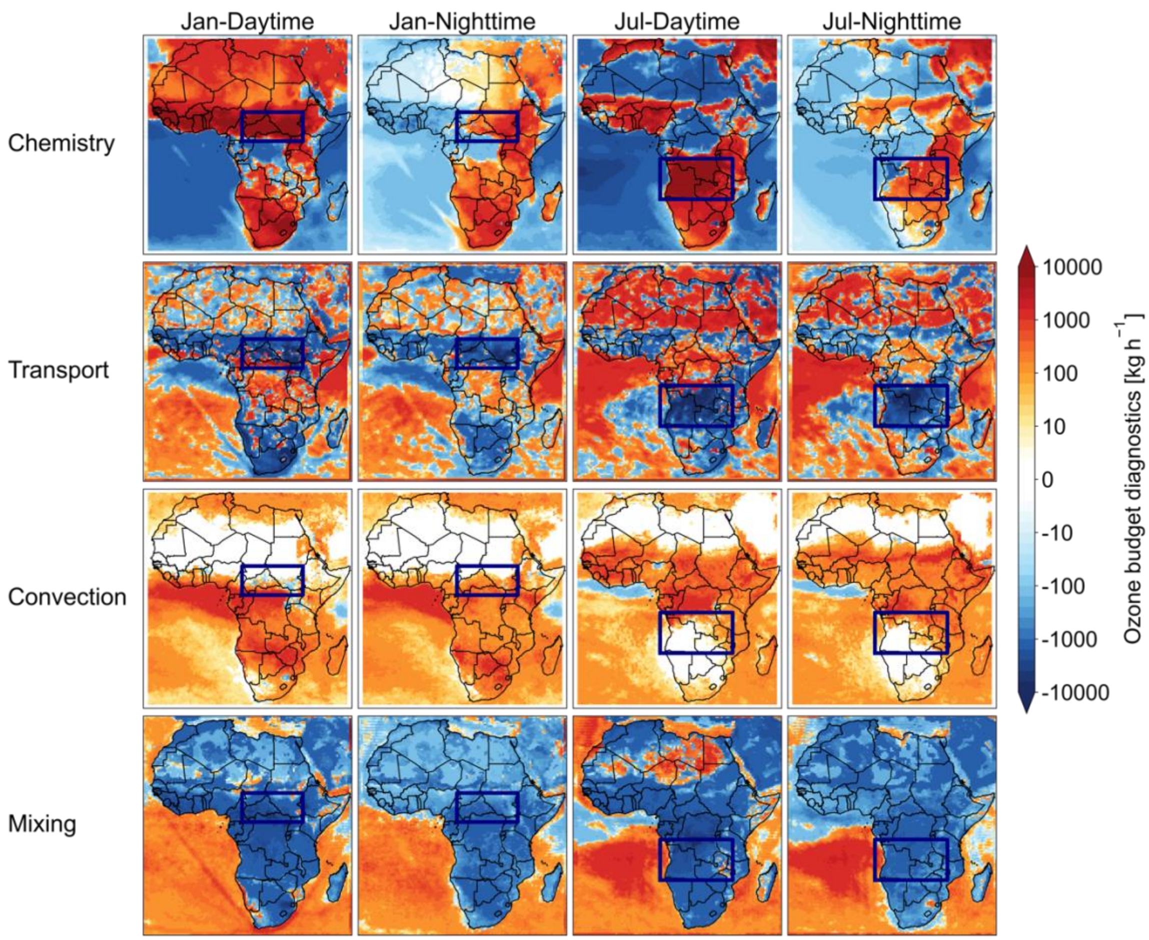

Figure S7. Ozone budget diagnostics (kg h^{-1}) in Africa for January and July 2019 from FREM_hourly, as estimated by the GEOS-Chem model. The diagnostics include contributions from chemistry, transport, convection, and mixing, with results shown separately for daytime and nighttime in each month.

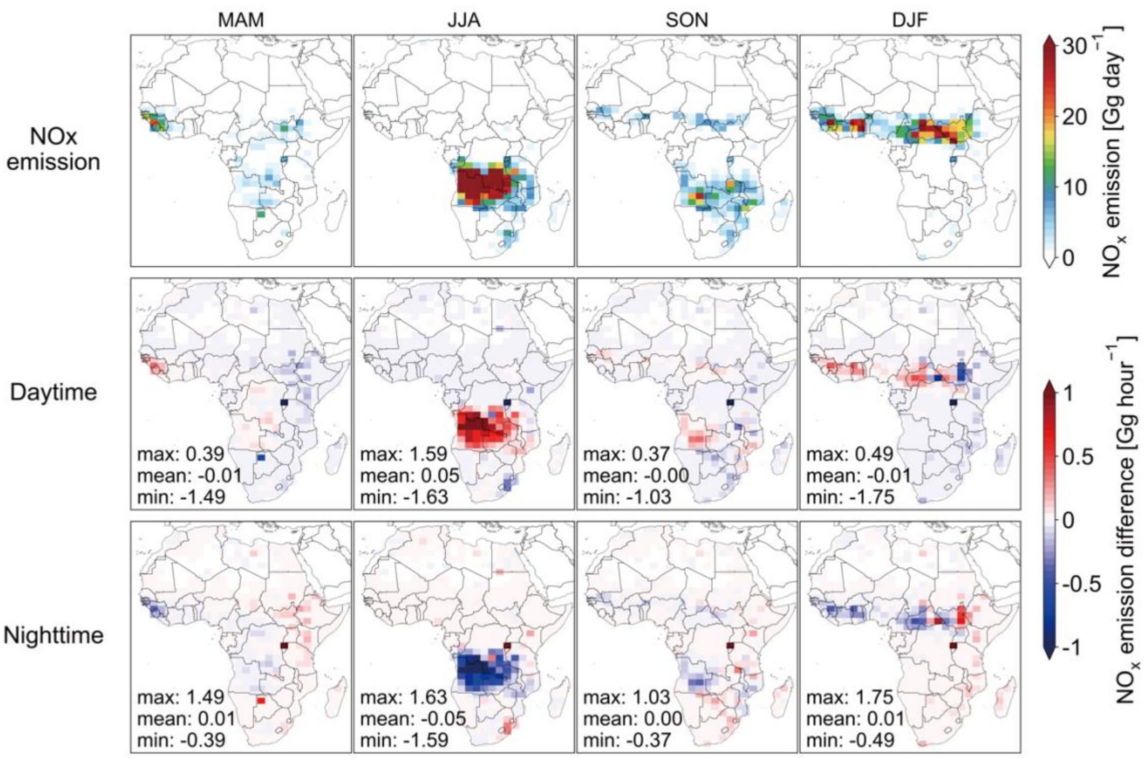

Figure S8. Spatial distribution of biomass burning NO_x emissions and daytime and nighttime differences between FREM hourly and FREM daily biomass burning emissions for different seasons in 2019.

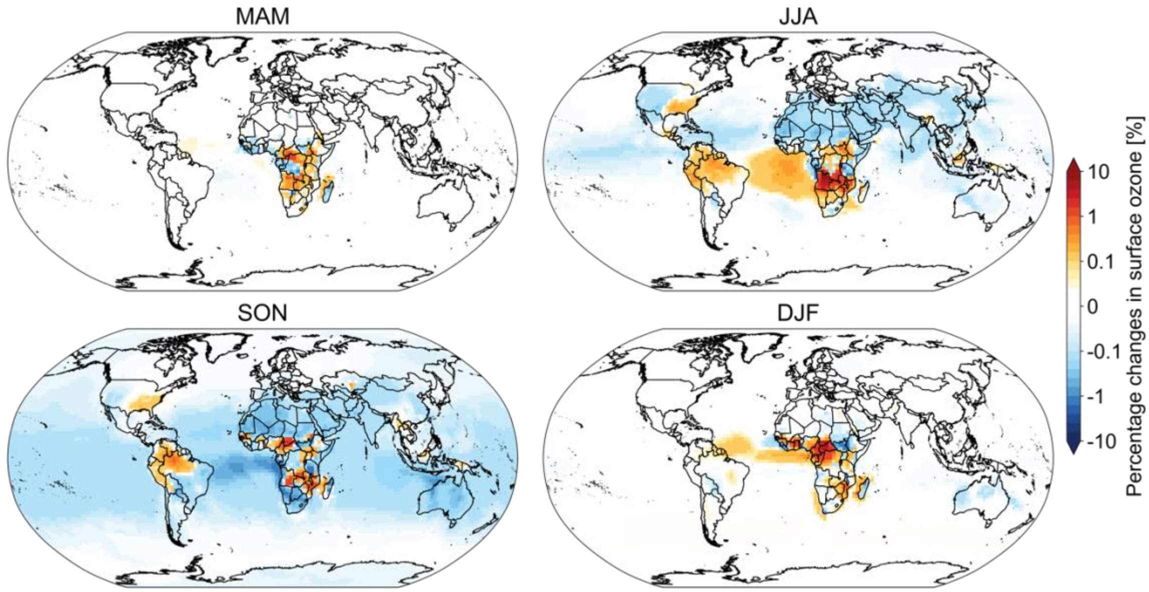

Figure S9. Same as Figure 5, but for the relative change in surface ozone.

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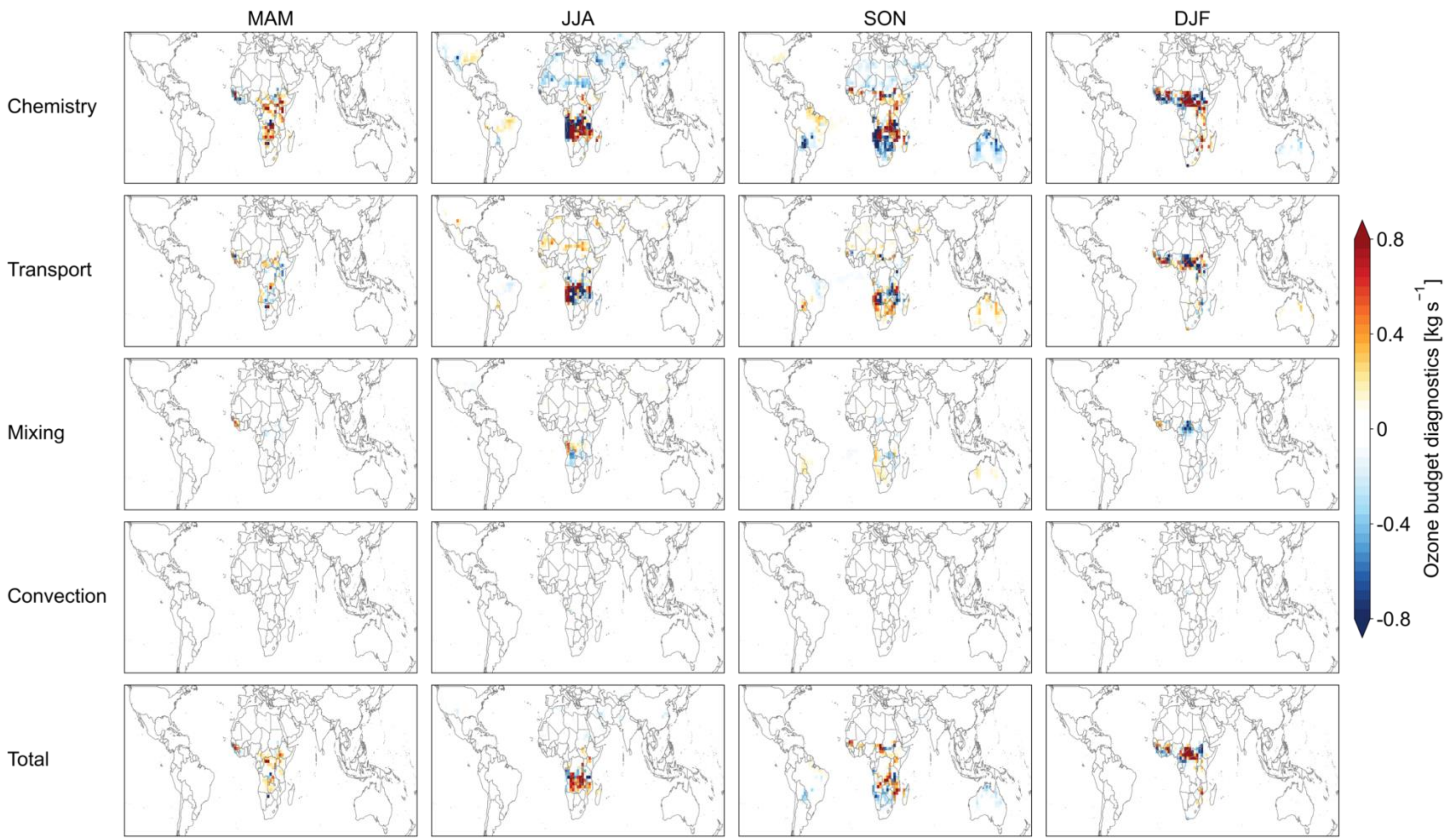

54 **Figure S10.** The impact of diurnal variations in African biomass burning emissions on ozone budget diagnostics (kg s^{-1}) across different
55 seasons in 2019, estimated using the GEOS-Chem model, includes effects from chemistry, transport, mixing, and convection.

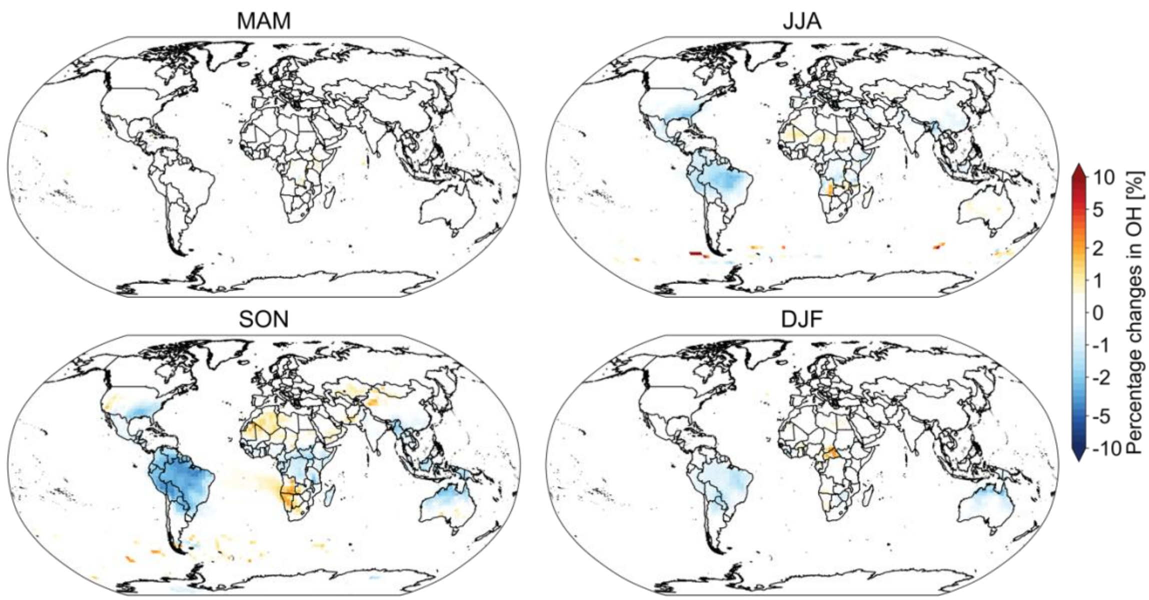

Figure S11. Same as Figure 5, but for the relative change in OH.