Supplement of Atmos. Chem. Phys., 25, 597–624, 2025
https://doi.org/10.5194/acp-25-597-2025-supplement

Atmospheric Chemistry and Physics
Open Access
EGU

Supplement of

Tropical upper-tropospheric trends in ozone and carbon monoxide (2005–2020): observational and model results

Lucien Froidevaux et al.

Correspondence to: Lucien Froidevaux (lucienf@jpl.nasa.gov)

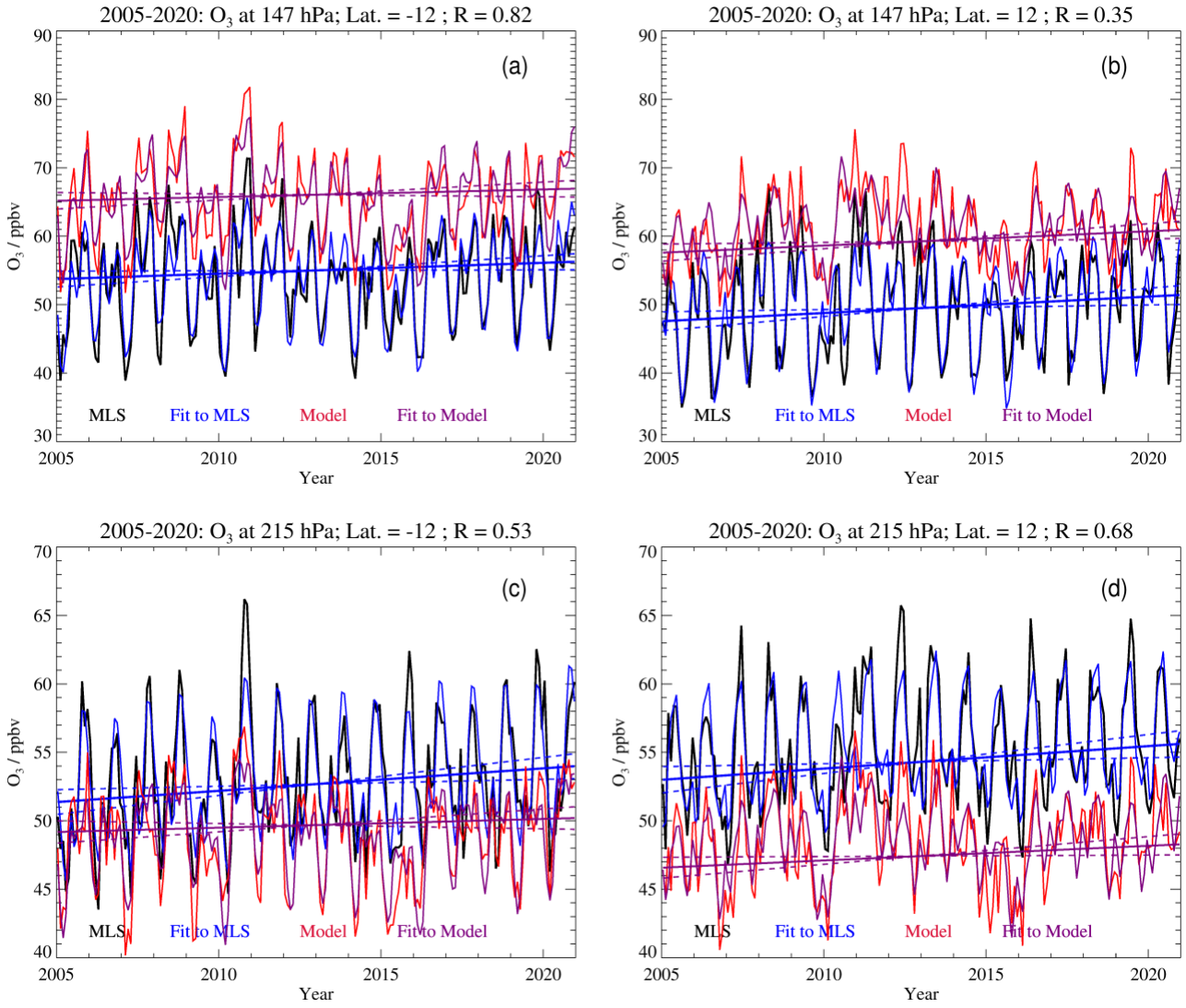

Figure S1. Examples of MLS and model simulation (from WACCM-CEDS) O_3 monthly zonal mean time series (2005—2020) for (a) 147 hPa and 12°S (meaning 10°S to 14°S), (b) 147 hPa and 12°N, (c) 215 hPa and 12°S, and (d) 215 hPa and 12°N. The MLS data (black) are fitted by the MLR model (shown in blue), and the WACCM-CEDS series (red) are fitted by the same type of regression model (purple). The blue and purple dashed lines are the linear components of the regression fits for the MLS and WACCM-CEDS curves, respectively. The correlation coefficient values (R) for the WACCM-CEDS versus MLS series are shown above each panel.

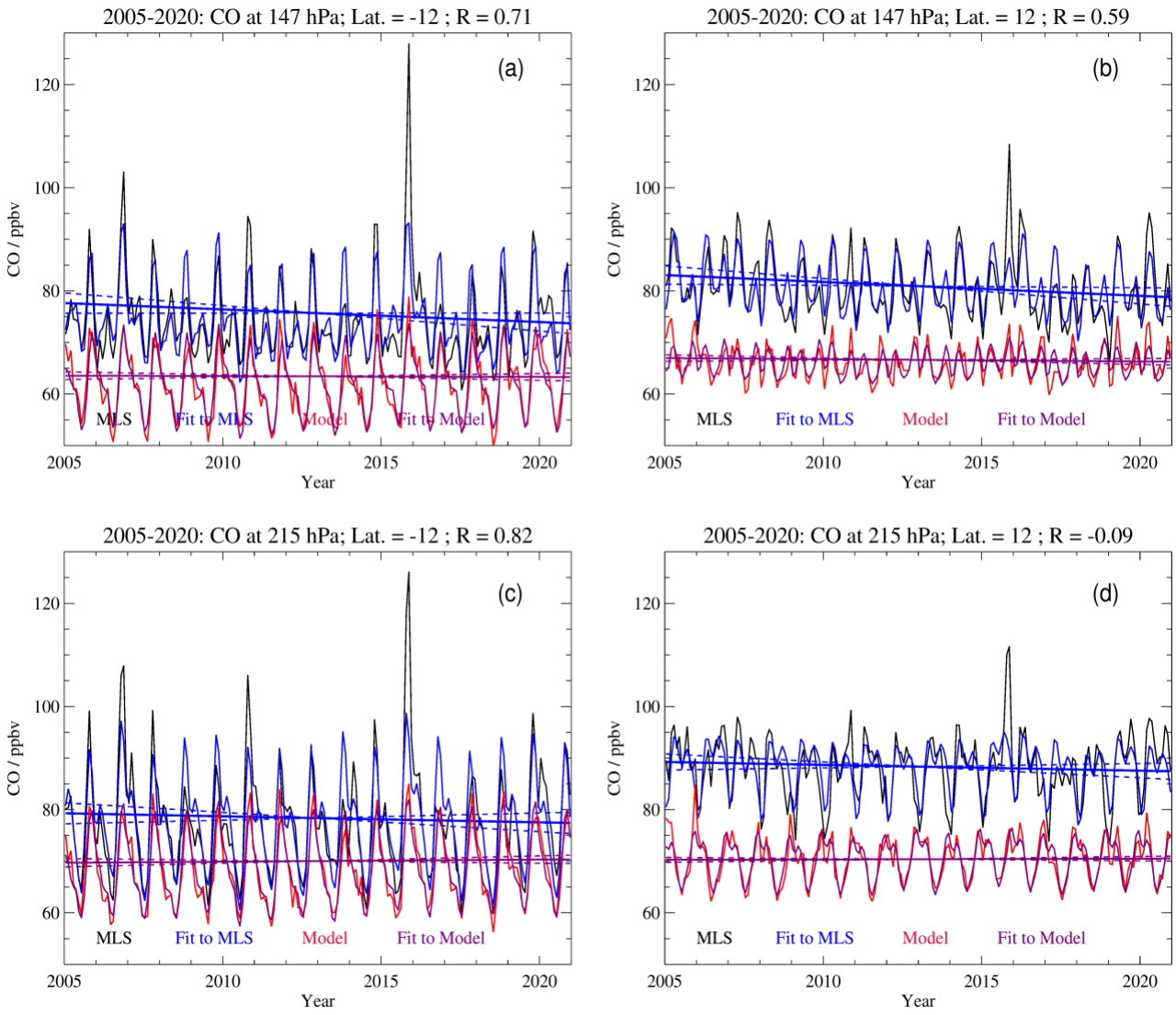

Figure S2. Same as Fig. S1 above, but for CO.

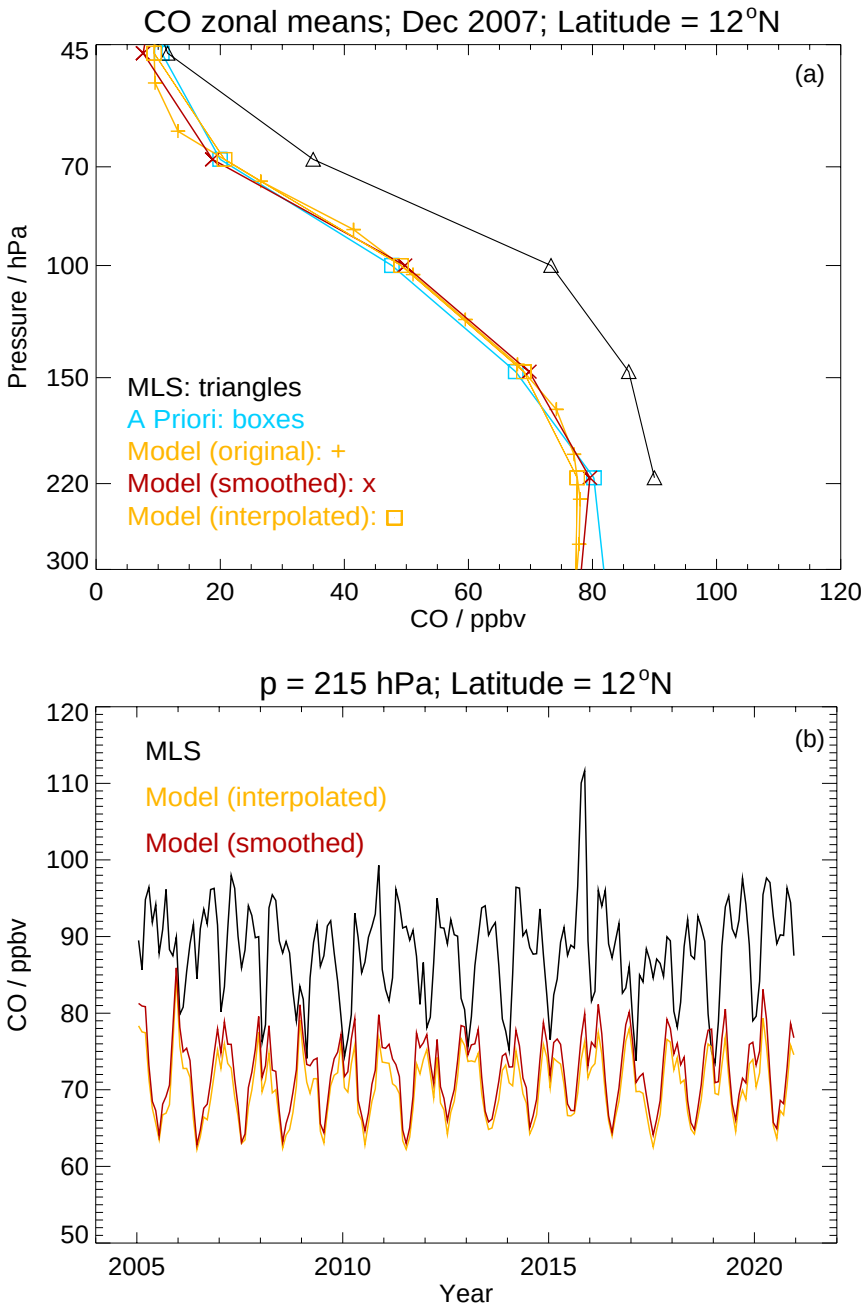

Figure S3. (a) Example of CO zonal mean profiles for December 2007 at 12ºN, with MLS profile (black triangles), a priori tropical profile (cyan boxes), WACCM original profile on model grid (orange plus signs), smoothed model profile (red crosses) using the MLS tropical averaging kernels, and model profile using a simple interpolation (oranges boxes). (b) CO zonal mean series at 215 hPa for 12ºN from MLS (black), WACCM series from simple interpolated profiles, (orange), and WACCM series from smoothed profiles using the MLS tropical averaging kernels and a priori profiles (see (a)).

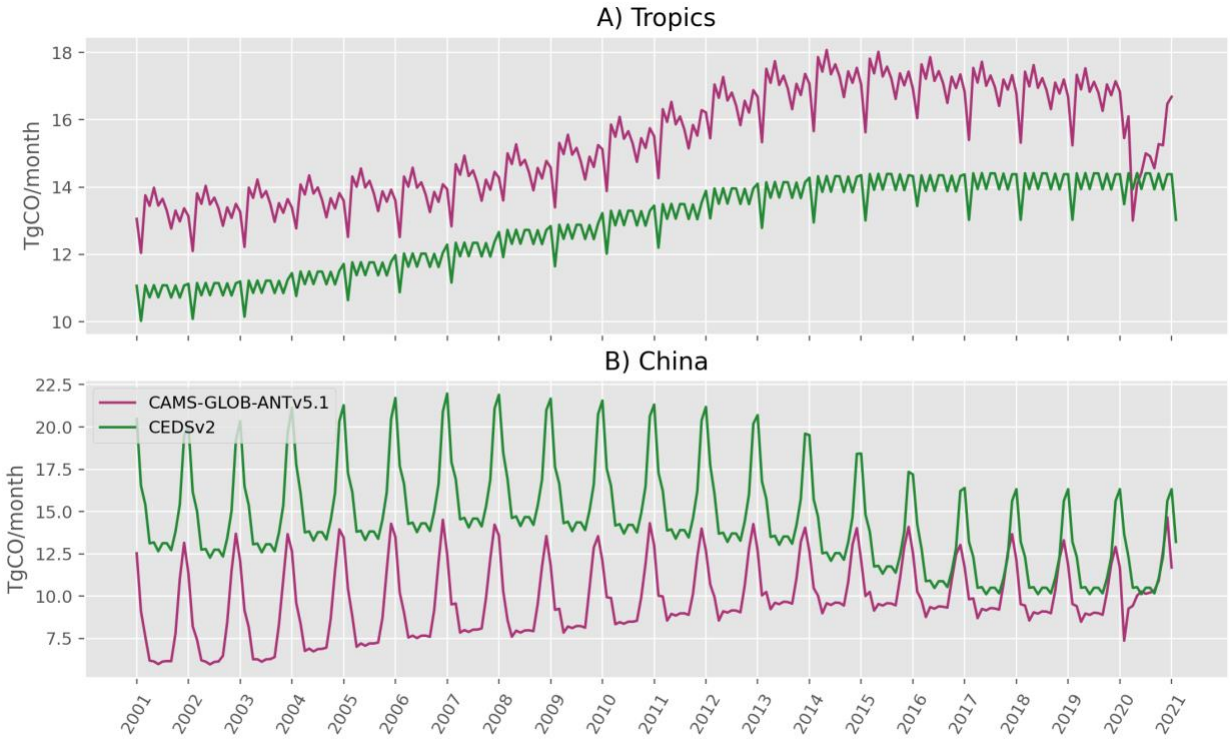

Figure S4. Emission time series for CAMS-GLOB-ANTv5.1 (Soulié et al., 2024) and CEDSv2 (McDuffie et al., 2020) for (A) the tropics (20°S–20°N) and (B) China.

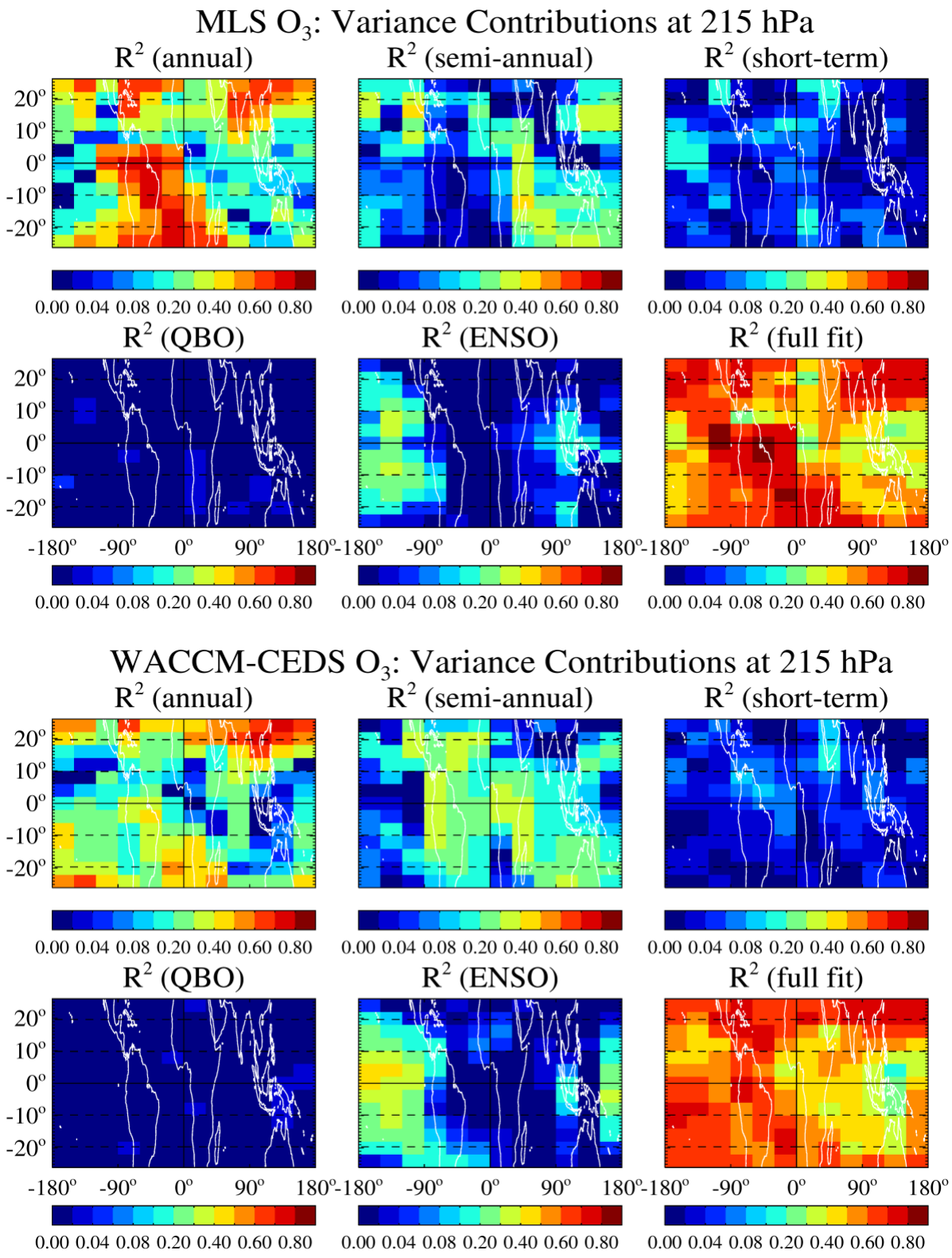

Figure S5. Same as Fig. 6 but for 215 hPa.

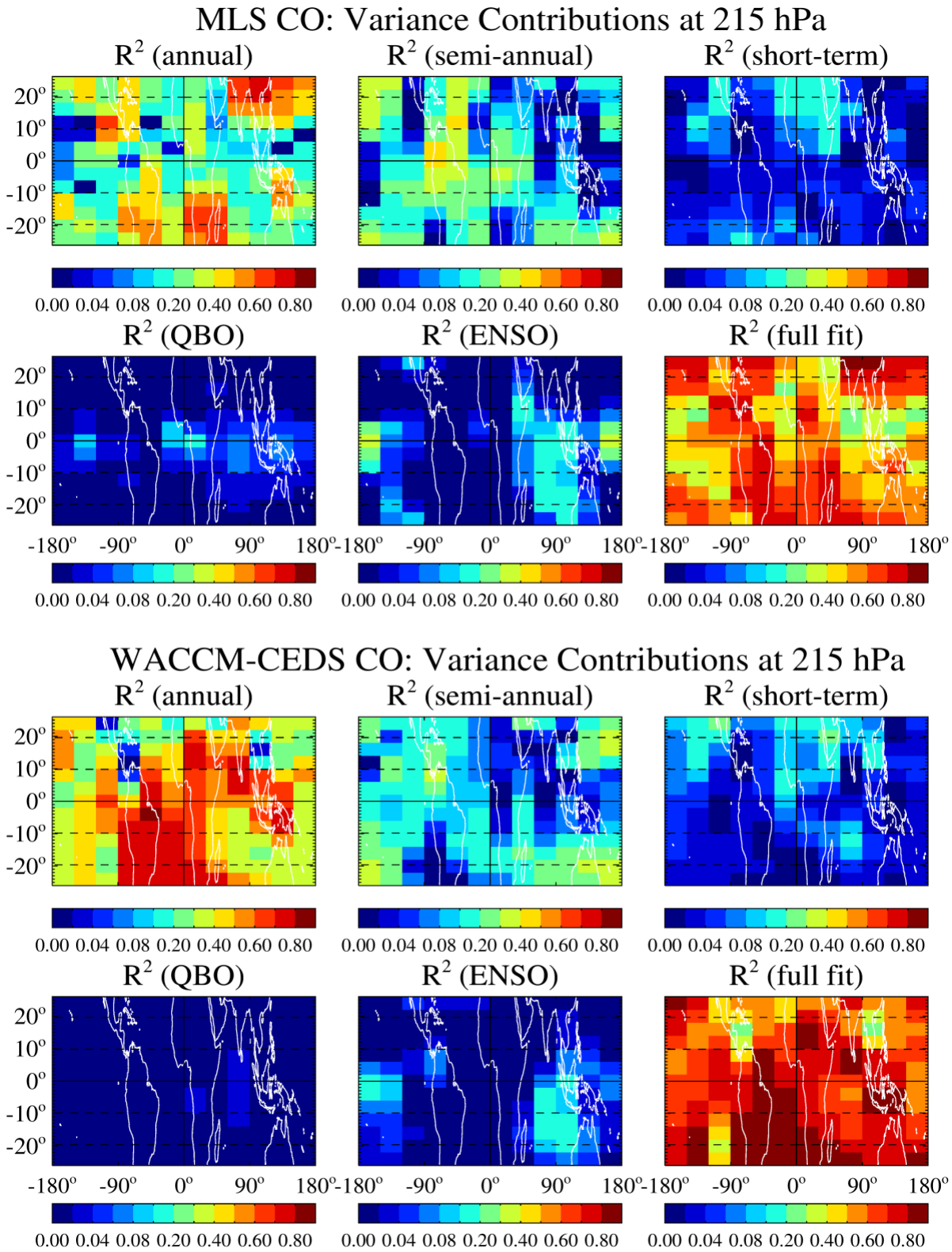

Figure S6. Same as Fig.15 but for 215 hPa.

Table S1. Aura MLS-derived tropical upper tropospheric trends (and 2σ uncertainties) for O_3, averaged between 147 and 215 hPa. Bold values highlight trends satisfying the 95% confidence level.

Latitude degrees	O_3 trend and uncertainty (2σ) % decade^{-1}	O_3 trend and uncertainty (2σ) ppbv decade^{-1}
24N	**3.64 ± 3.10**	**2.96 ± 2.56**
20N	**3.87 ± 2.94**	**2.63 ± 2.01**
16N	**4.46 ± 3.10**	**2.64 ± 1.83**
12N	**4.22 ± 2.93**	**2.21 ± 1.52**
8N	**4.42 ± 2.82**	**2.18 ± 1.38**
4N	**4.22 ± 2.71**	**2.08 ± 1.32**
0	**4.03 ± 2.63**	**1.99 ± 1.29**
4S	**3.67 ± 2.59**	**1.81 ± 1.27**
8S	**3.73 ± 2.69**	**1.90 ± 1.37**
12S	**3.53 ± 2.59**	**1.87 ± 1.38**
16S	**3.44 ± 2.64**	**1.95 ± 1.51**
20S	**2.95 ± 2.57**	**1.88 ± 1.67**
24S	**2.32 ± 2.14**	**1.77 ± 1.66**

Table S2. Aura MLS-derived tropical upper tropospheric trends (and 2σ uncertainties) for CO, averaged between 147 and 215 hPa. Bold values highlight trends satisfying the 95% confidence level.

Latitude degrees	CO trend and uncertainty (2σ) % decade^{-1}	CO trend and uncertainty (2σ) ppbv decade^{-1}
24N	**-3.32 ± 2.90**	**-2.59 ± 2.26**
20N	**-2.85 ± 2.79**	**-2.28 ± 2.24**
16N	**-2.81 ± 2.71**	**-2.30 ± 2.22**
12N	-2.30 ± 2.50	-1.90 ± 2.10
8N	-2.26 ± 2.56	-1.87 ± 2.15
4N	-2.57 ± 2.70	-2.10 ± 2.24
0	-2.78 ± 3.06	-2.22 ± 2.47
4S	-2.60 ± 3.15	-2.05 ± 2.51
8S	-2.40 ± 3.20	-1.86 ± 2.50
12S	-2.41 ± 3.33	-1.81 ± 2.53
16S	-2.28 ± 3.41	-1.66 ± 2.49
20S	-2.41 ± 3.33	-1.69 ± 2.36
24S	-2.31 ± 3.30	-1.51 ± 2.24