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Atmospheric Chemistry and Physics Discussions

Supplement of

Characterizing tropospheric ozone and CO around Frankfurt between 1994–2012 based on MOZAIC-IAGOS aircraft measurements

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Supplementary material

Table S1: Anthropogenic (from the MACC global inventory) and biomass burning (from the GFAS global inventory) CO emissions changes between 2002 and 2012, in different regions of the world (see Fig. 10 for the regions description). Relative changes are given with 2002 as reference.

	Anthropogenic		Biomass burning		Total	
	Tg/yr	%	Tg/yr	%	Tg/yr	%
Boreal North America	-4.6	-46.1	-7.3	-40.5	-12.0	-42.5
Temperate North America	-40.5	-54.2	2.0	31.3	-38.4	-47.4
Central America	0.5	3.3	-0.8	-16.0	-0.4	-2.0
NH South America	0.3	5.6	-0.4	-10.8	-0.1	-1.5
SH South America	1.0	5.8	-8.0	-16.6	-7.0	-10.5
Europe	-16.9	-42.8	0.3	24.3	-16.6	-40.9
Middle East	3.7	10.6	-0.0	-1.6	3.7	10.0
NH Africa	10.1	21.0	-17.4	-29.2	-7.2	-6.7
SH Africa	8.8	28.8	4.8	7.7	13.6	14.6
Boreal Asia	-0.4	-4.3	34.1	69.4	33.7	58.3
Central Asia	21.2	13.5	-7.3	-40.0	13.9	8.0
Southeast Asia	13.8	10.9	4.3	22.7	18.1	12.5
Equatorial Asia	-3.4	-14.2	-22.0	-46.2	-25.4	-35.6
Australia and New Zealand	-1.7	-40.8	4.8	15.1	3.0	8.5
World	-8.1	-1.4	-13.0	-3.5	-21.1	-2.2

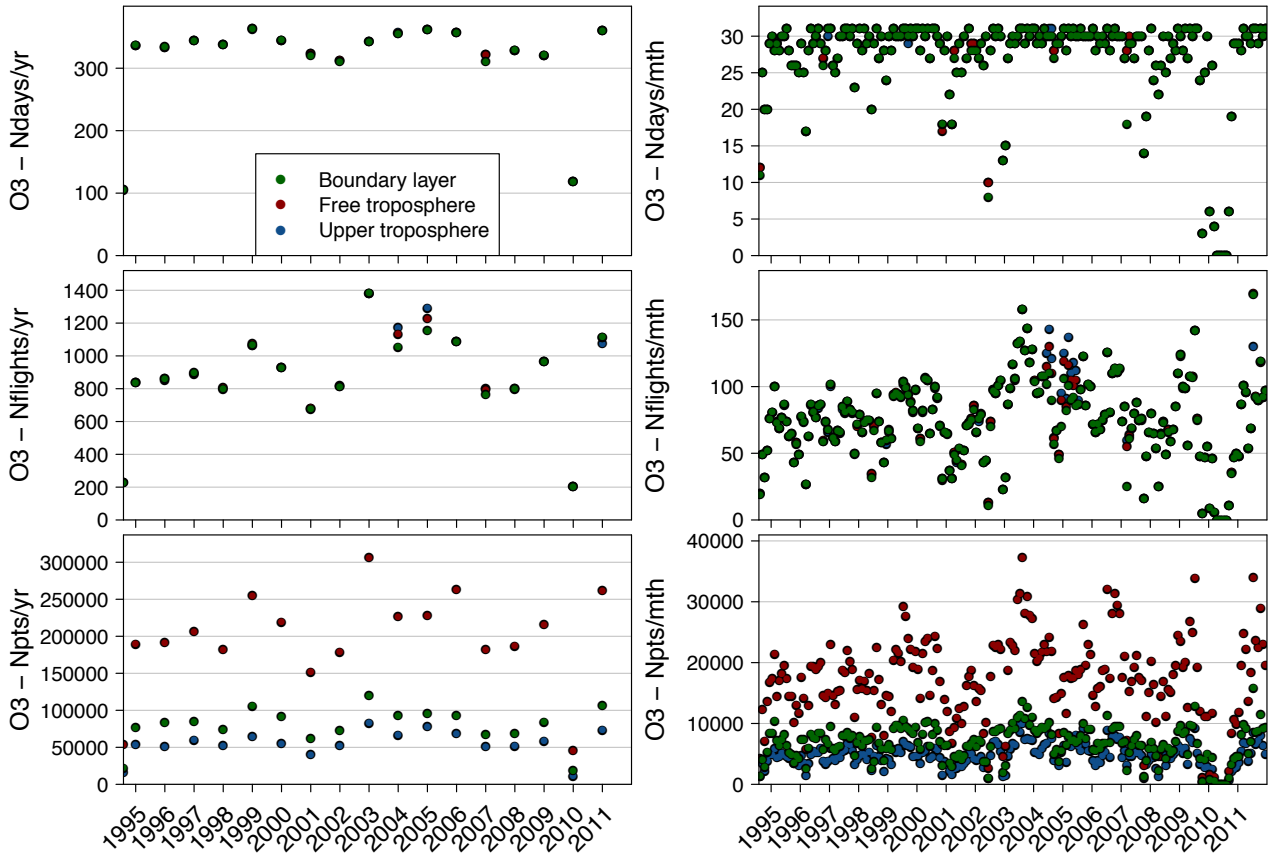

Figure S1: Number of days (top panel), flights (middle panel) and points (bottom panel) of available O_3 measurements per year (left panel) and per month (right panel), for the three different layers.

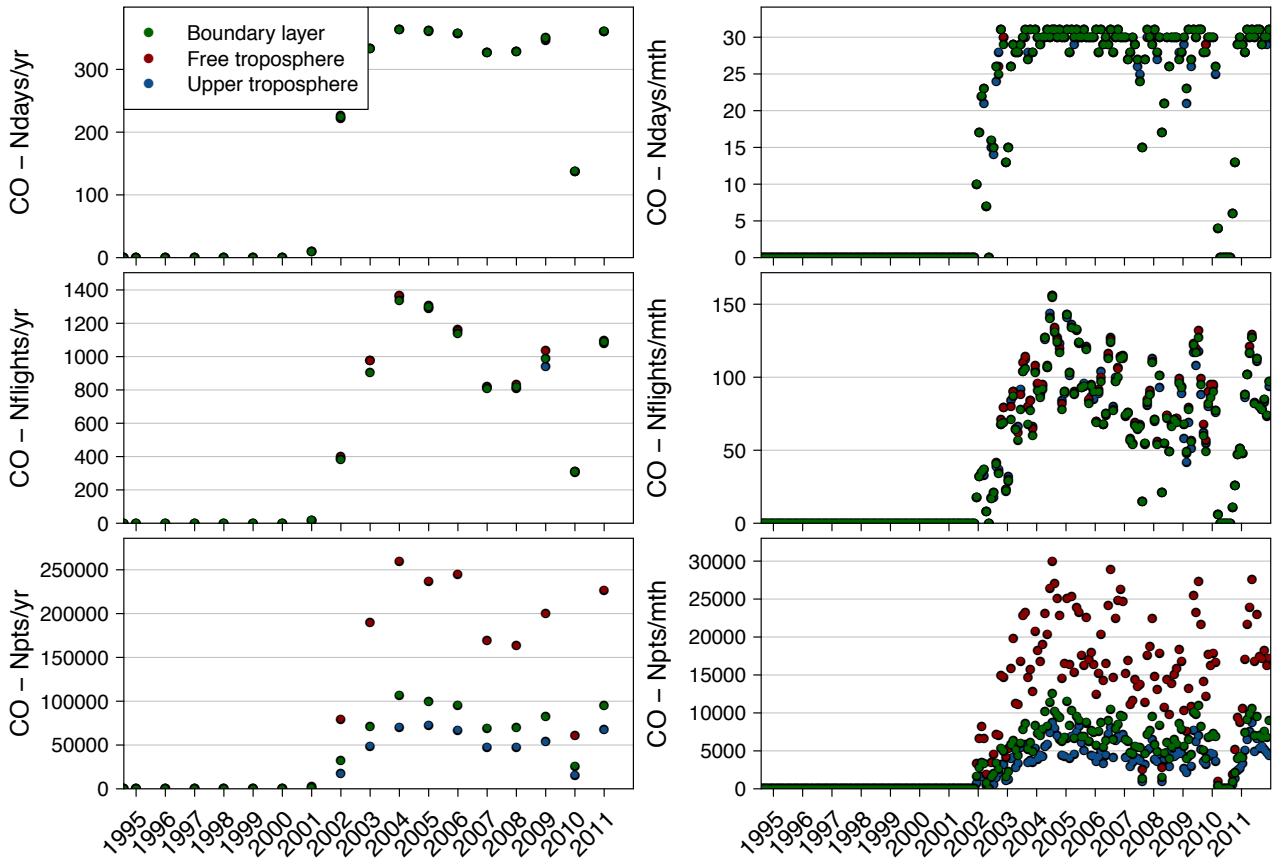

Figure S2: Same as Fig. S1 for CO.

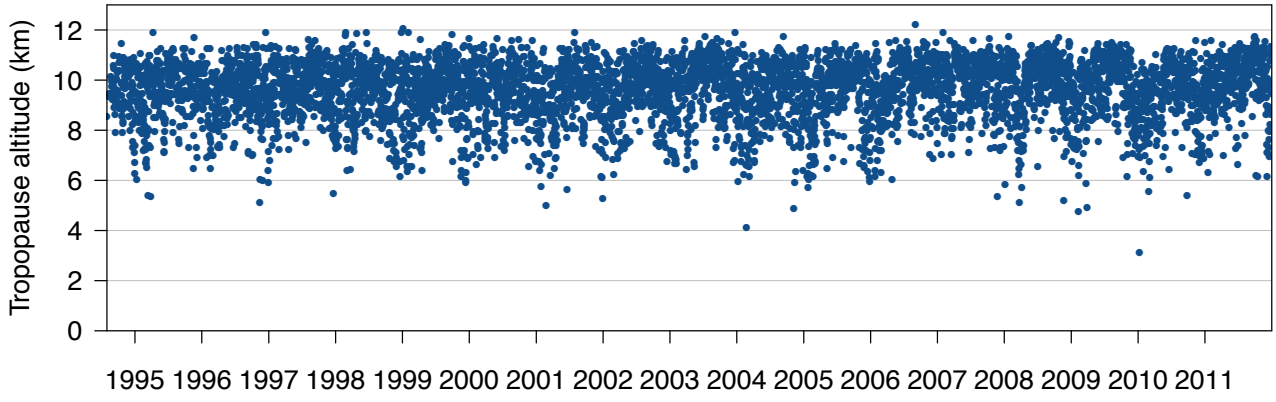

Figure S3: Daily dynamical tropopause (DT) altitude of all Frankfurt/Munich flights along the 1994-2011 period (when several flights during one day, DT is estimated for all of them and then averaged). Note that no chemical measurements (O_3, CO) are required for estimating the DT altitude, which explains the absence of gaps in data (contrary to O_3 and CO time series).

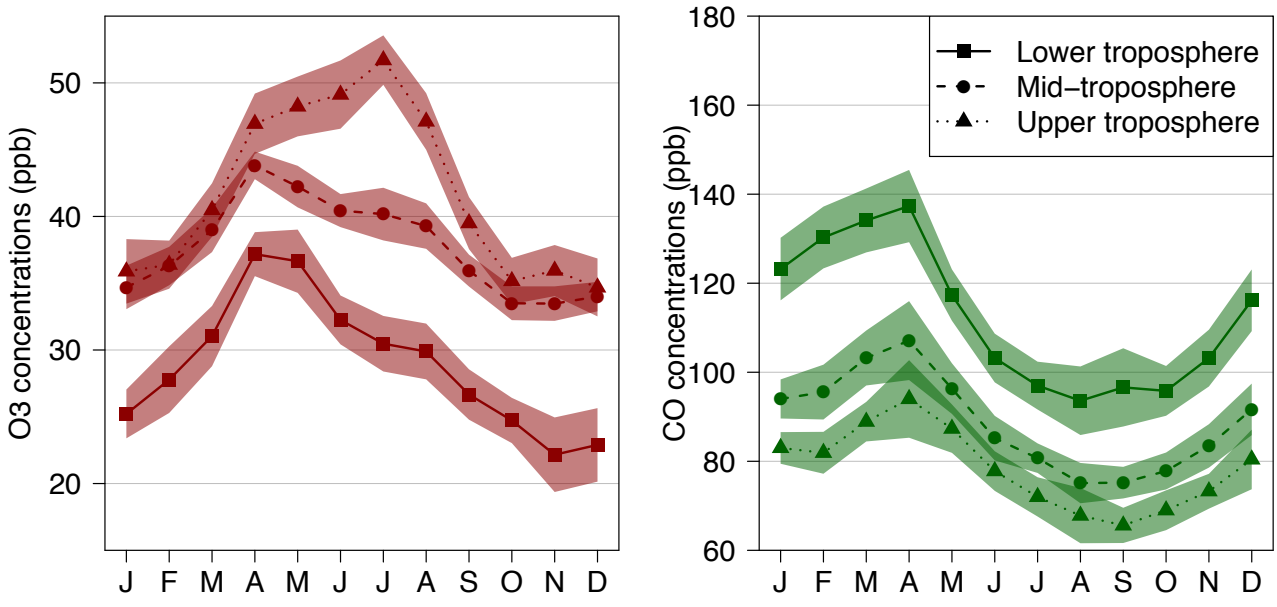

Figure S4: O_3 (left panel) and CO (right panel) 5th percentile monthly profiles above Frankfurt/Munich in the three tropospheric sublayers.

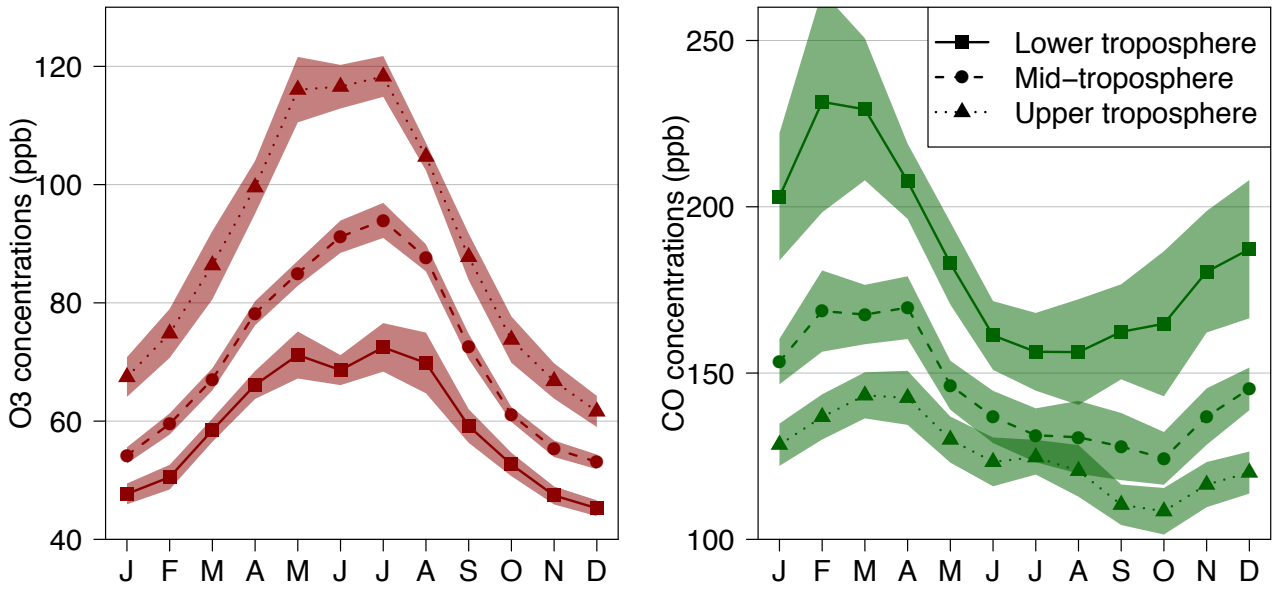

Figure S5: Same as Fig. S4 for the 95th percentile.

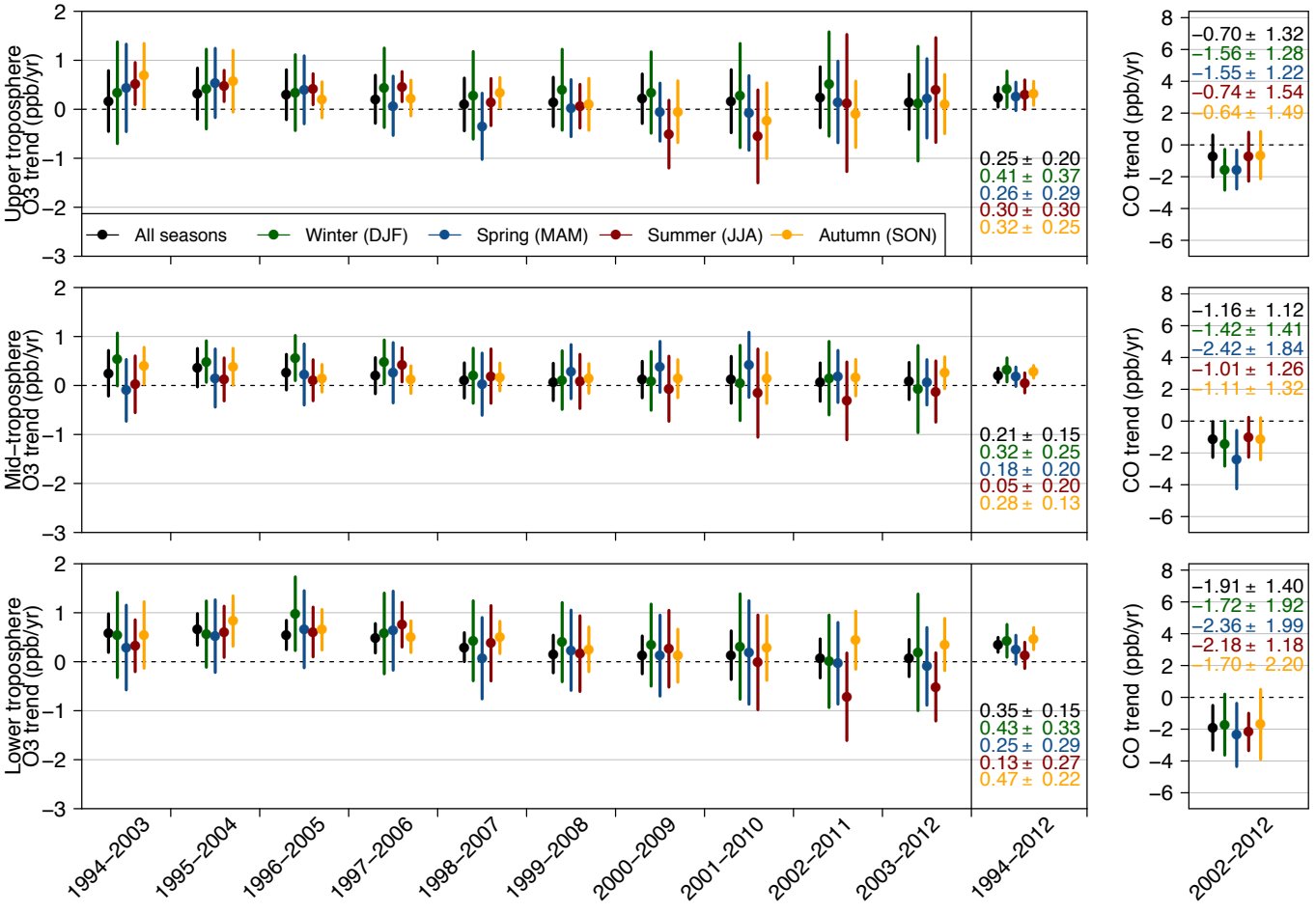

Figure S6: Annual and seasonal ozone 5th percentile linear trends on moving 10-years periods and along the whole period. Uncertainties (vertical bars) are indicated at the 95% confidence interval. Trends and uncertainties over the 1994-2012 period are also indicated.

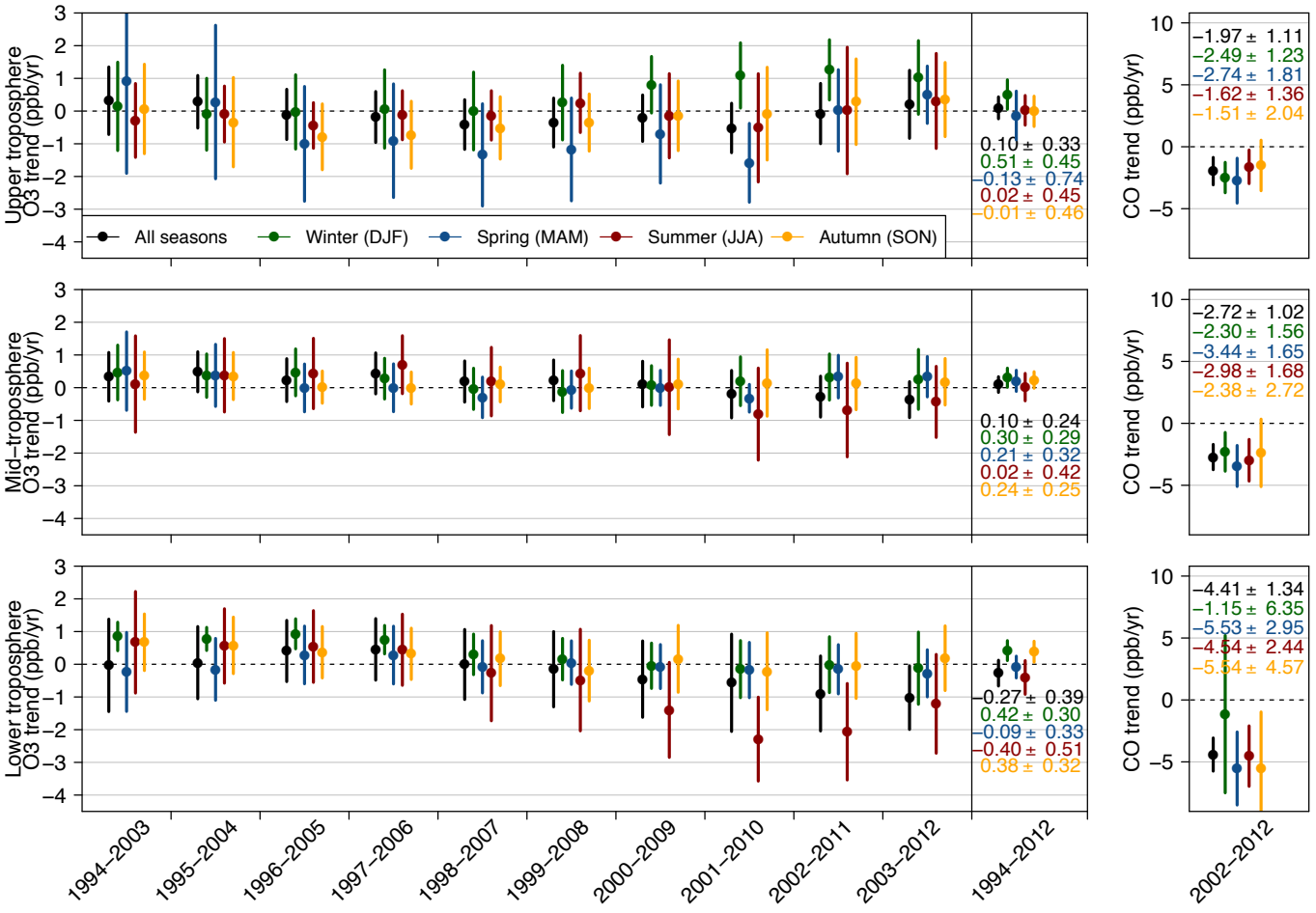

Figure S7: Same than Fig. S6 with 95th percentile ozone.

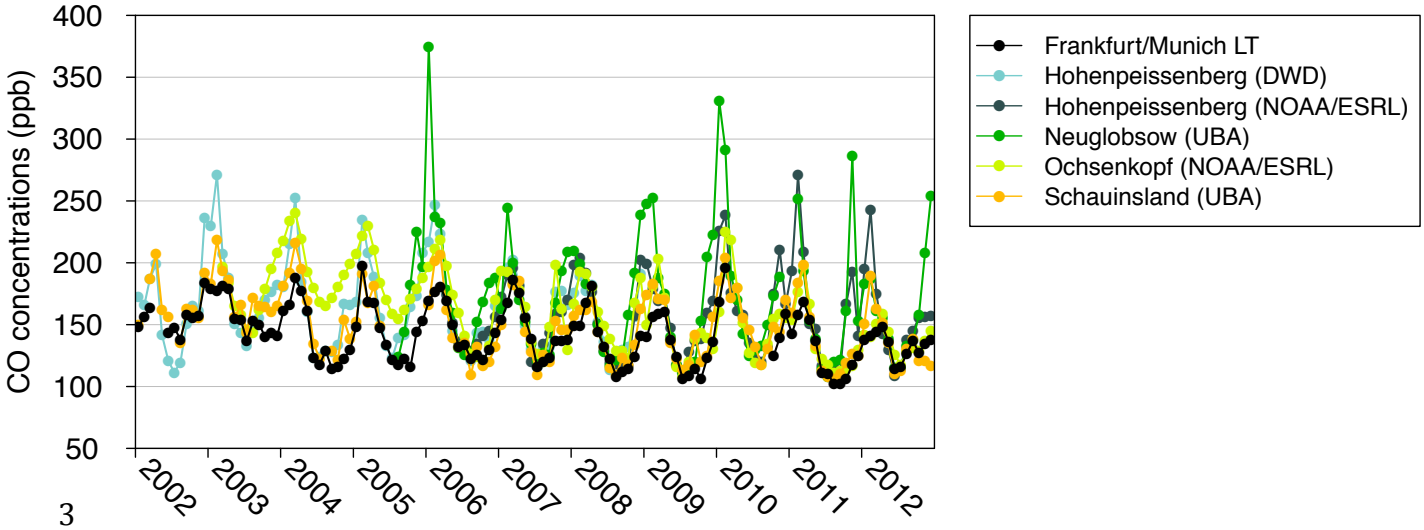

Figure S8: CO monthly mixing ratios in lower troposphere above Frankfurt/Munich and at several ground sites in Germany, as measured by the Deutscher Wetterdienst (DWD), the NOAA Earth System Research Laboratory (NOAA/ESRL) and Umweltbundesamt (UBA).