Supplement of

Tropospheric ozone responses to the El Niño-Southern Oscillation (ENSO): quantification of individual processes and future projections from multiple chemical models

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Table S1. Key metrics for quantifying ozone-ENSO relationship over 2005-2014 from OMI satellite observations, GEOS-Chem and CMIP6 models results.

	WP					EP				
	r_{max}	m_{max}	r_{mean}	m_{mean}	$Area_{\%}$	r_{min}	m_{min}	r_{mean}	m_{mean}	$Area_{\%}$
OMI/MLS	0.57	2.12	0.42	1.31	0.94	-0.79	-2.67	-0.52	-1.42	0.89
GEOS-Chem	0.51	1.97	0.37	1.16	0.90	-0.79	-2.81	-0.51	-1.63	0.89
BCC-ESM1	0.47	0.85	0.29	0.54	0.61	-0.74	-1.60	-0.45	-0.97	0.73
CESM2-WACCM	0.64	1.71	0.39	0.90	0.94	-0.85	-1.98	-0.51	-0.90	0.79
EC-Earth3-AerChem	0.62	2.76	0.44	1.57	0.98	-0.90	-2.72	-0.63	-1.69	0.85
GFDL-ESM4	0.55	1.54	0.33	0.81	0.76	-0.81	-2.69	-0.61	-1.65	0.99
MRI-ESM2-0	0.66	2.29	0.47	1.30	0.95	-0.86	-2.61	-0.64	-1.53	0.77

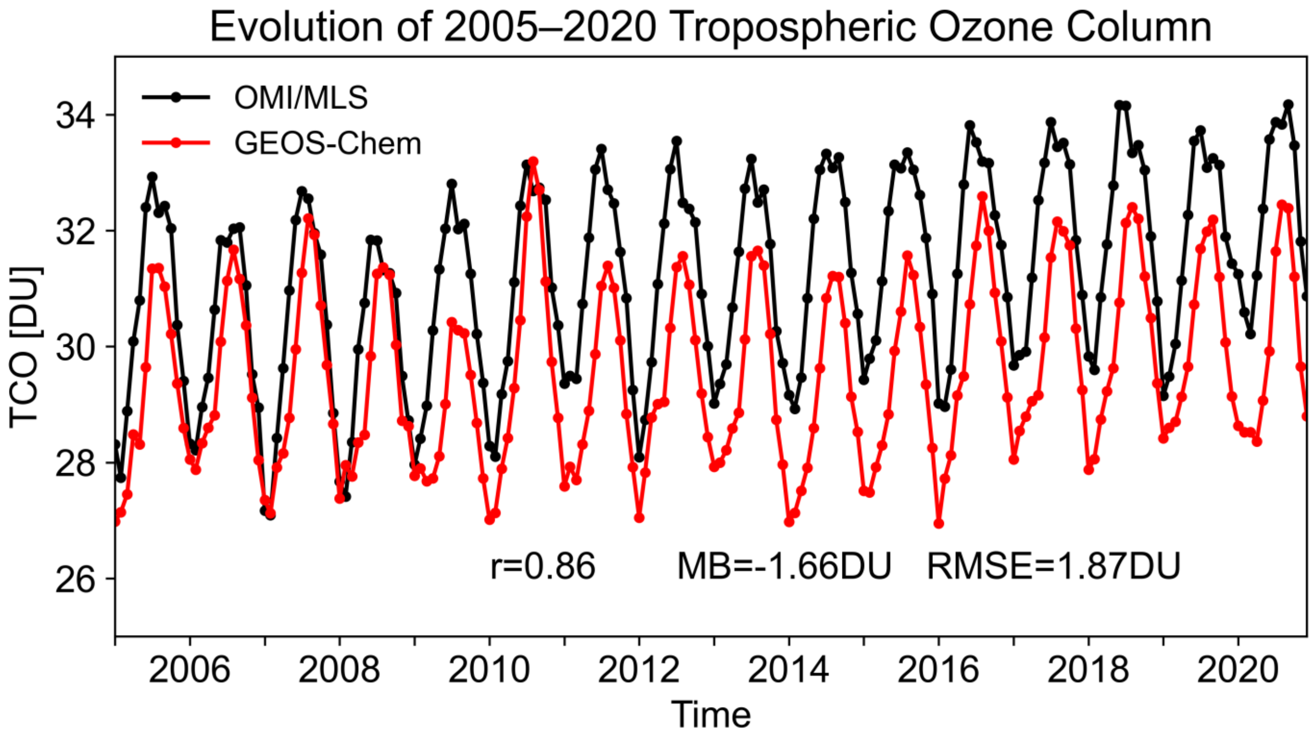

Figure S1. The interannual variation of tropospheric column ozone (TCO) concentration in the 60°N-60°S region for the period 2005-2020 from OMI/MLS satellite observations and GEOS-Chem model simulation. The correlation coefficient, mean bias (MB), and Root Mean Squared Error (RMSE) are shown inset.

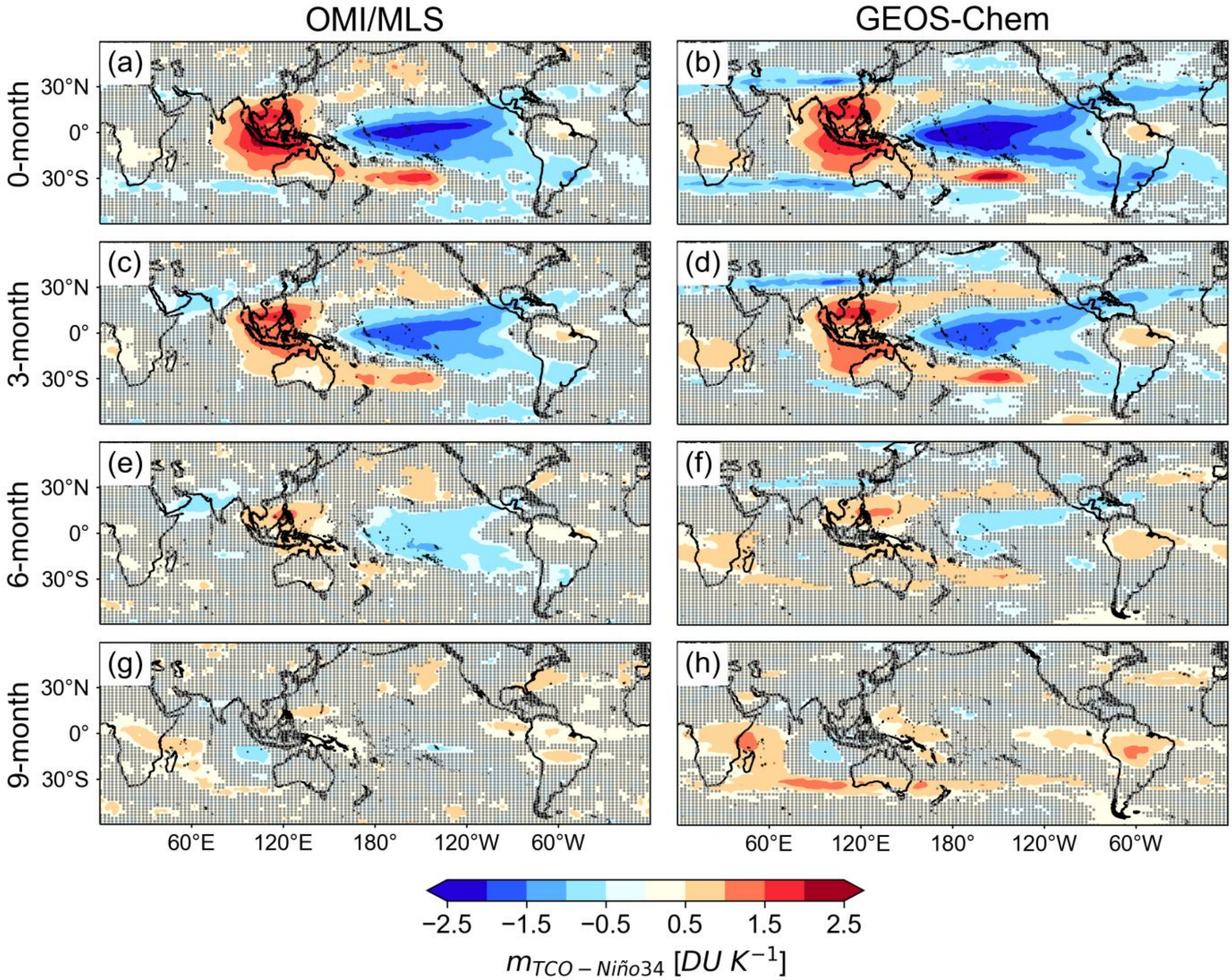

Figure S2. Same as Figure 2 but for $m_{\text{TCO-Niño34}}$.

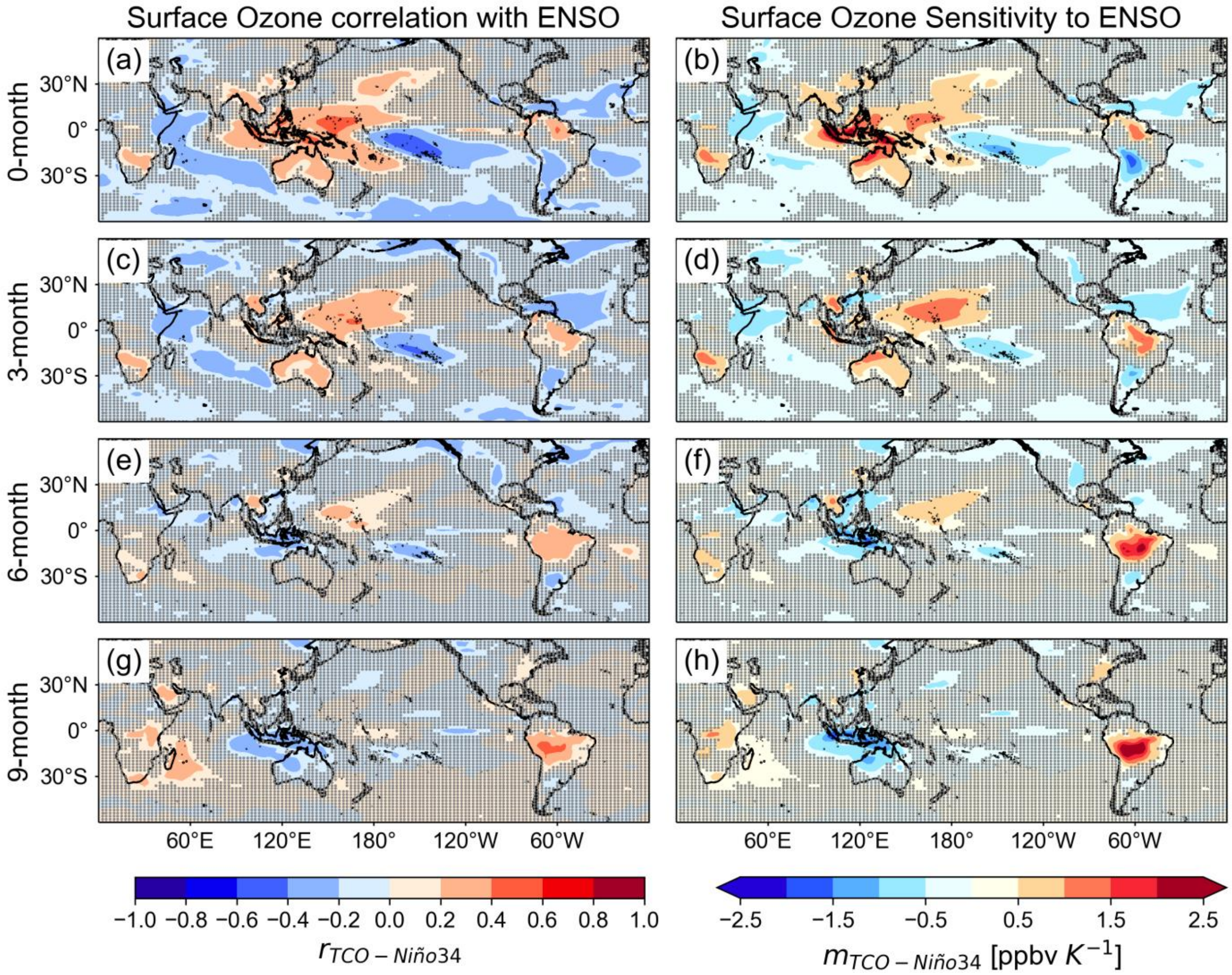

Figure S3. Same as Figure 2 and S2 but for surface ozone concentrations and for GEOS-Chem model only.

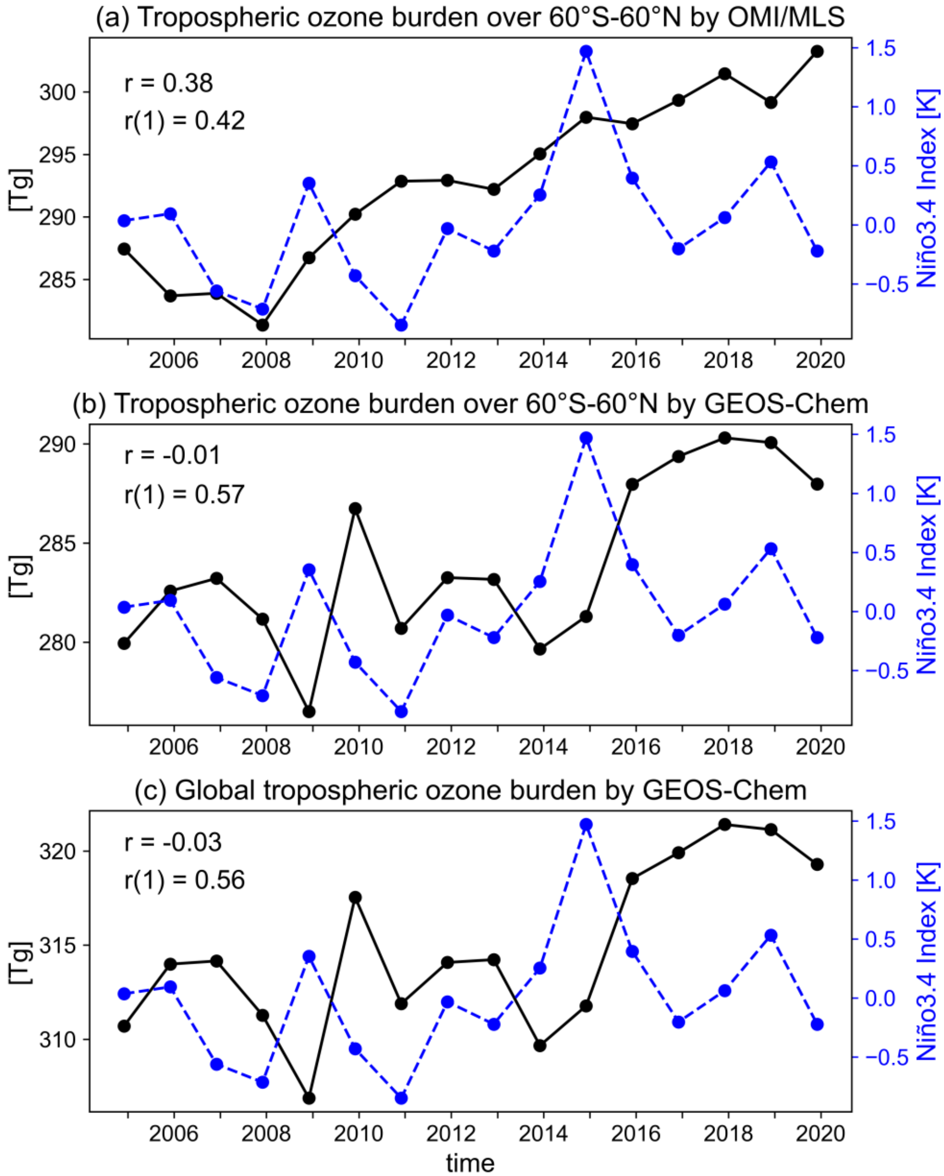

Figure S4. Response of tropospheric ozone burden to ENSO on interannual scale. Panels (a) and (b) show the tropospheric ozone burden over 60°S-60°N from OMI/MLS satellite product and GEOS-Chem simulations, and panel (c) show the global tropospheric ozone burden from GEOS-Chem, all with the Niño3.4 index over 2005-2020 shown in blue. The correlation coefficient between the ozone burden and Niño3.4 index (both for the same year (r) and for Niño3.4 index leading by one-year (r(1)) are shown in set.

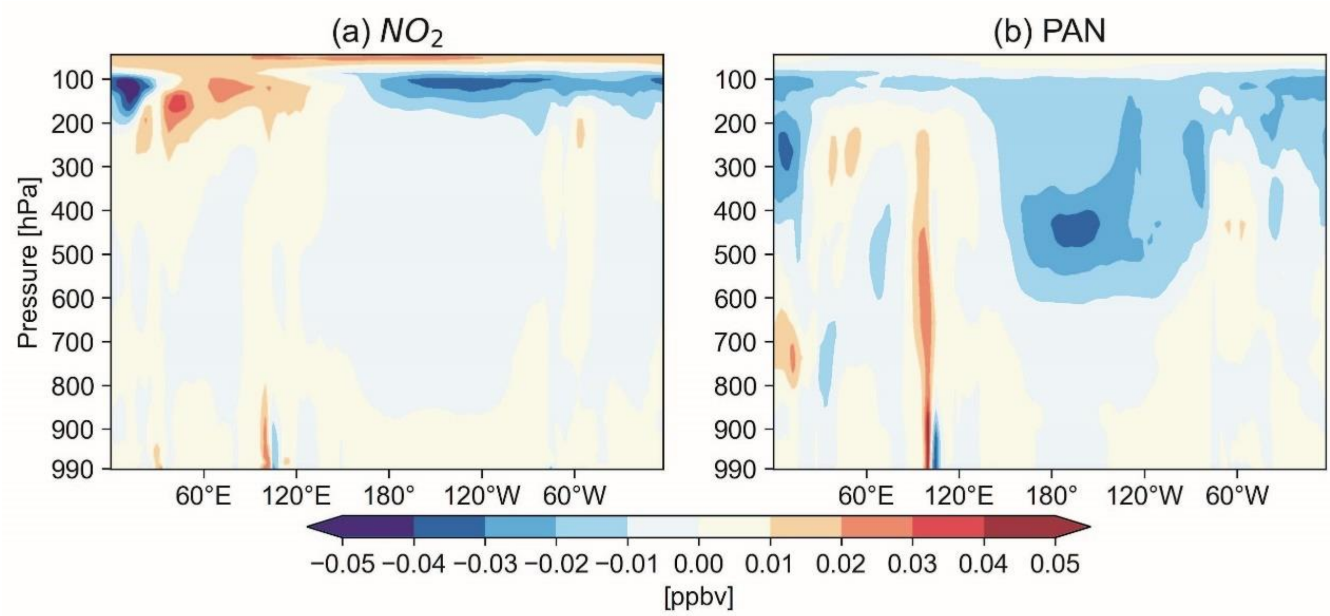

Figure S5. The vertical distribution of (a)NO_2 and (b)PAN difference between TRANSPORT simulation during El Niño periods and BASE simulation during Normal periods in the equatorial region (5°S-5°N).

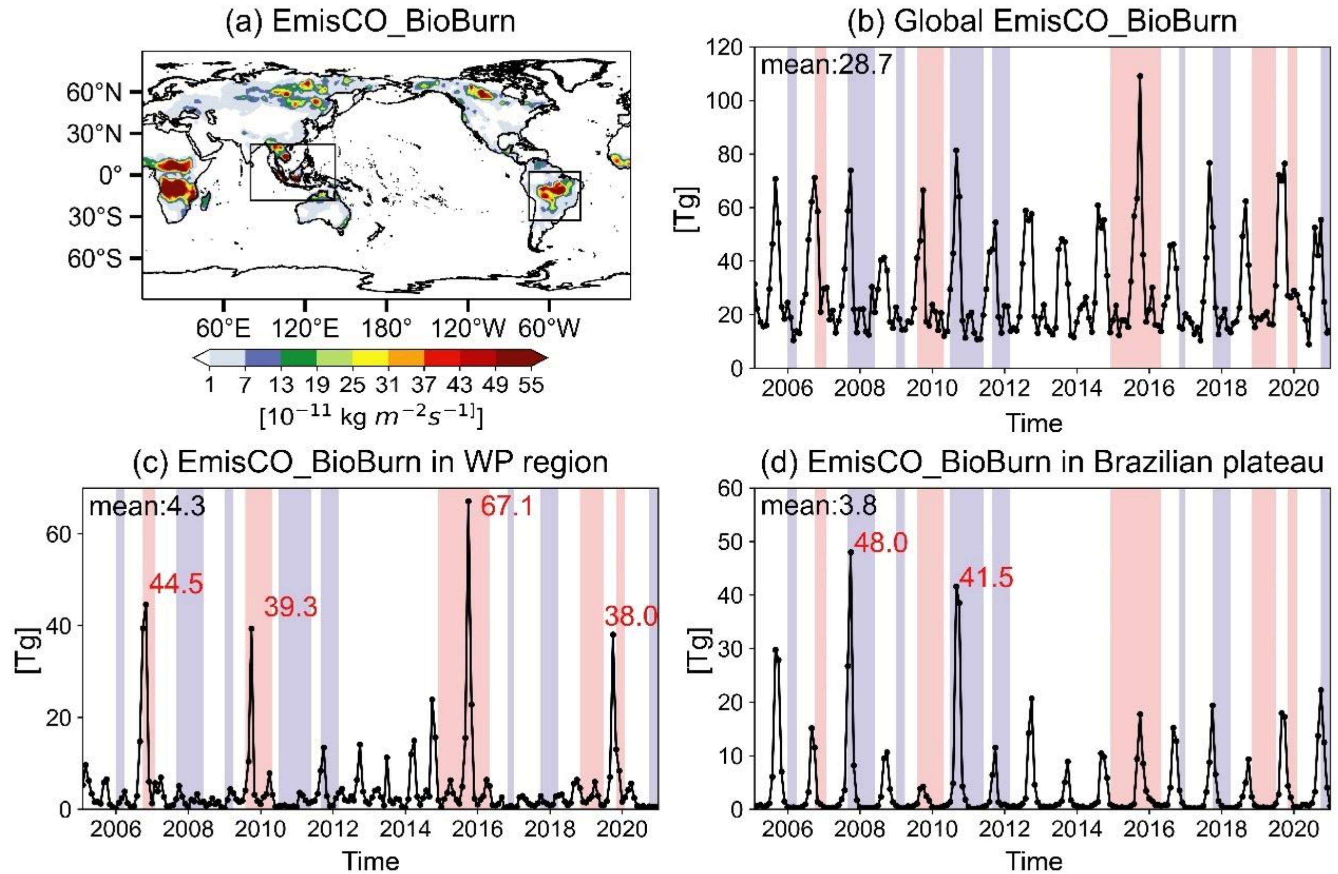

Figure S6. The CO emissions from biomass burning: (a) global mean spatial distribution, (b) total global emissions, (c) total emissions in the WP region, and (d) total emissions in the Brazilian plateau over 2005-2020. The red (blue) shading represents El Niño (La Niña) events with the Niño3.4 index greater than 0.5 (less than -0.5).

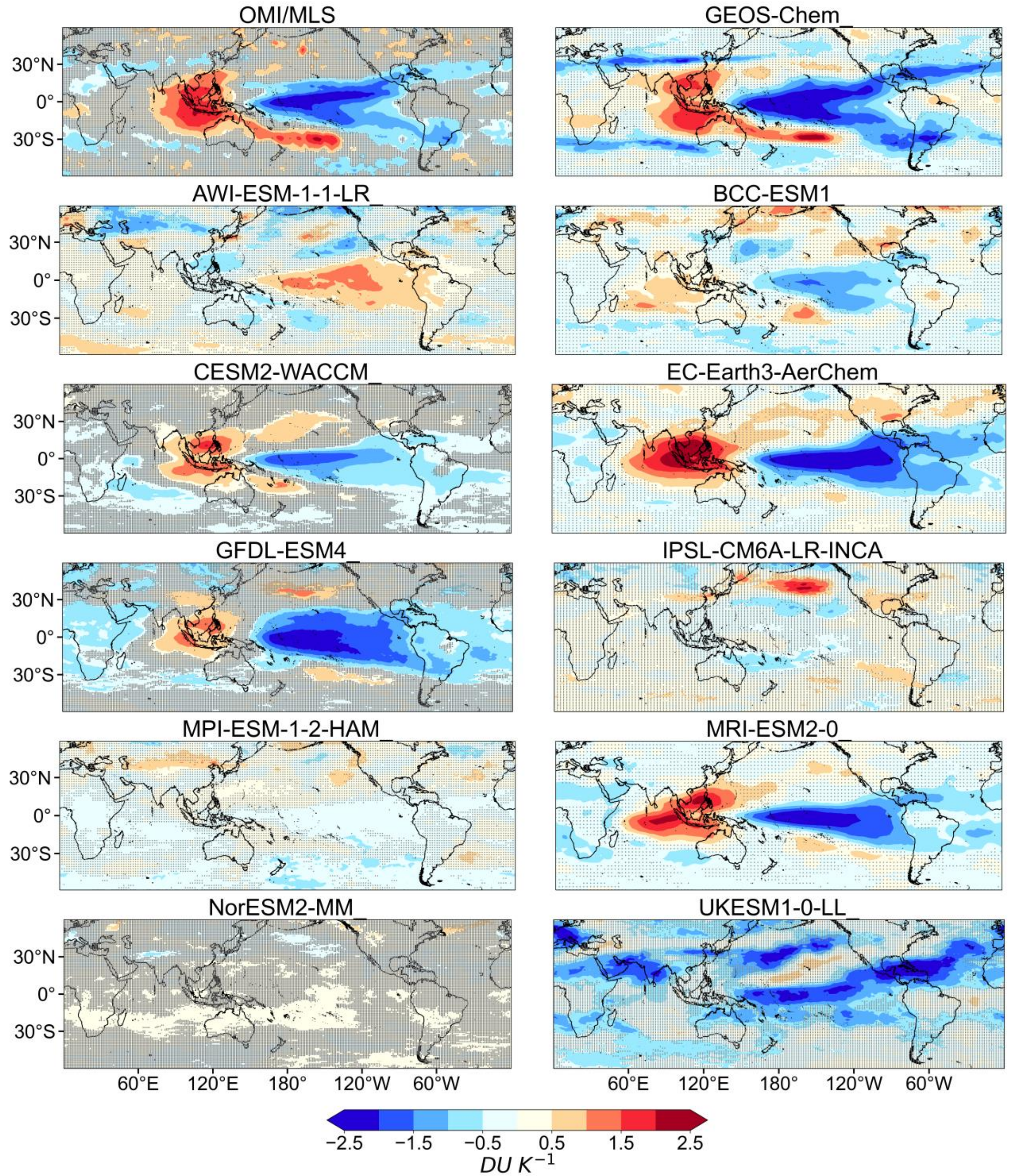

Figure S7. Same as Figure 6 but for $m_{\text{TCO-Niño34}}$.

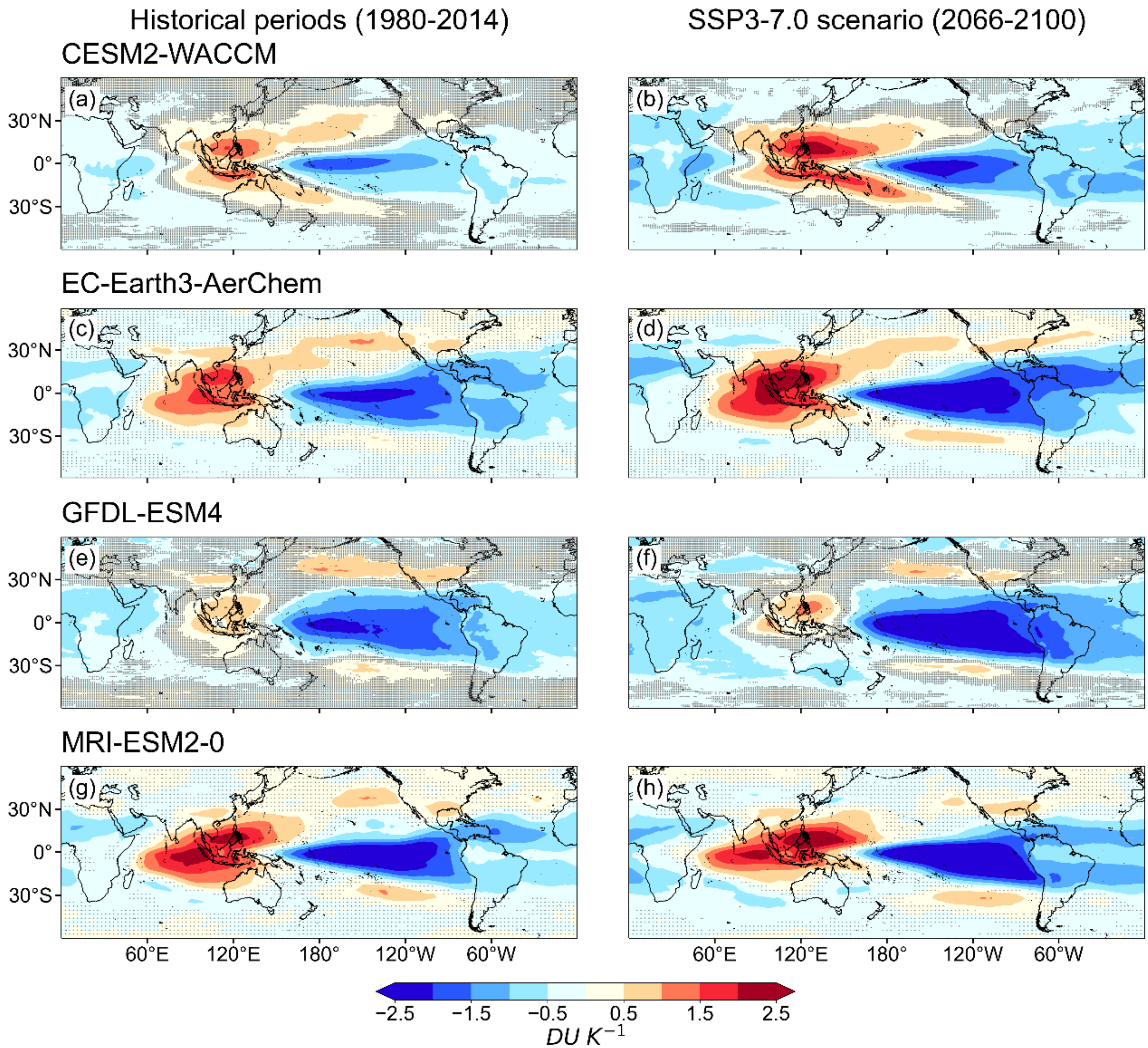

Figure S8. Same as Figure 9 but for $m_{\text{TCO-Niño34}}$.