Supplement of Atmos. Chem. Phys., 17, 9781–9796, 2017
https://doi.org/10.5194/acp-17-9781-2017-supplement

Atmospheric Chemistry and Physics
Open Access
EGU

Supplement of

Responses of surface ozone air quality to anthropogenic nitrogen deposition in the Northern Hemisphere

Yuanhong Zhao et al.

Correspondence to: Lin Zhang (zhanglg@pku.edu.cn)

S1 Simulated soil NO_x emissions and vegetation LAI

Figure S1 shows the comparison of above-canopy NO_x emissions derived in GEOS-Chem (Hudman et al., 2012) and CLM. We can see that above-canopy NO_x emissions from the modified CLM are in good agreement with the GEOS-Chem results. These modifications also partly correct the significant high biases in CLM simulated LAI relative to satellite measurements from MODIS and AVHRR. As shown in Figure S2, there is about 10% bias reduction in the modified CLM LAI, although large positive biases remain over the Northern Hemisphere continents.

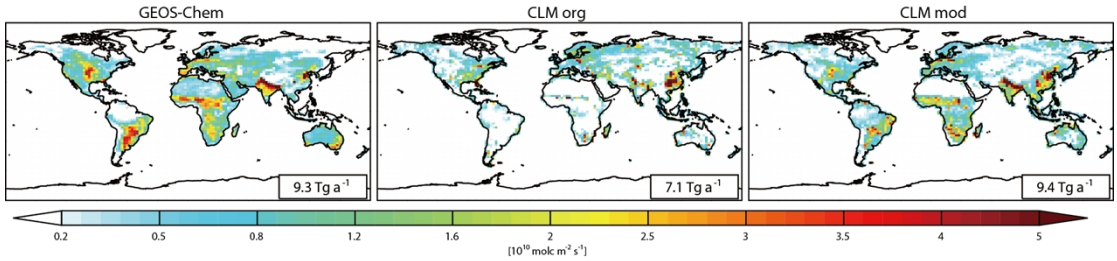

Figure S1. Above-canopy NO_x emissions from soil simulated by GEOS-Chem (left), original CLM (middle), and modified CLM (right). Annual emission totals averaged over 2006-2010 are shown inset.

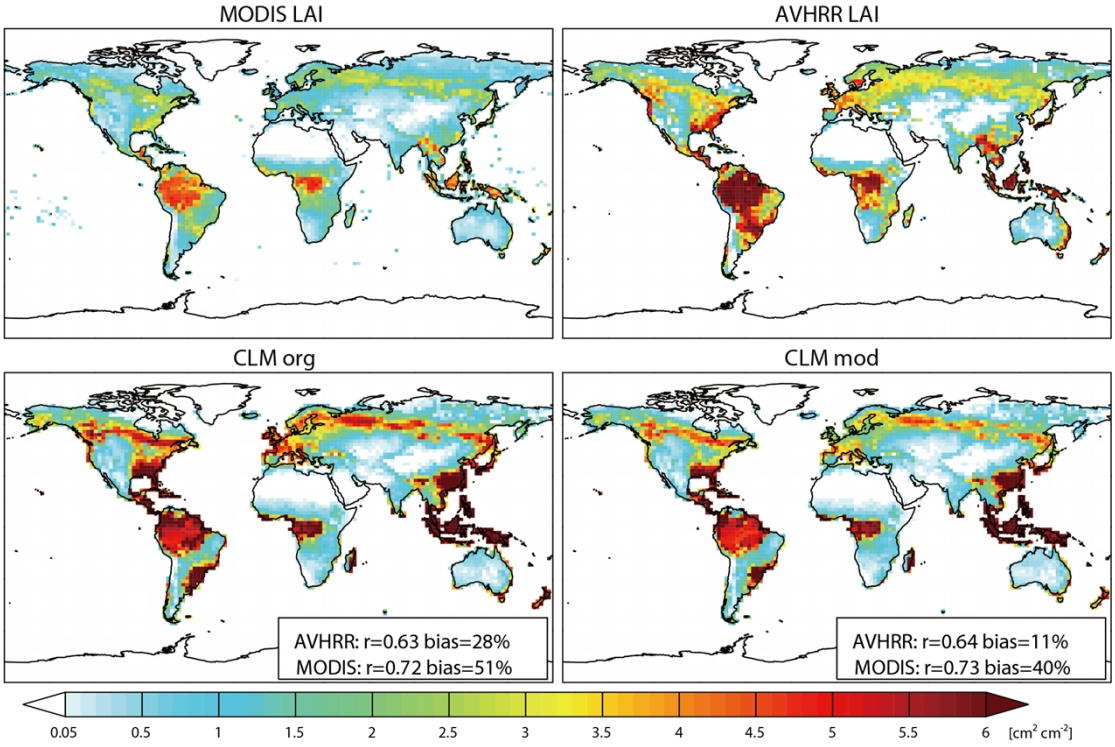

Figure S2. Spatial distribution of annual mean LAI observed from MODIS (top-left panel) and AVHRR (top-right panels) satellite instruments in 2000, as well as those simulated by the original CLM model (CTM org) and our modified model (CLM mod).

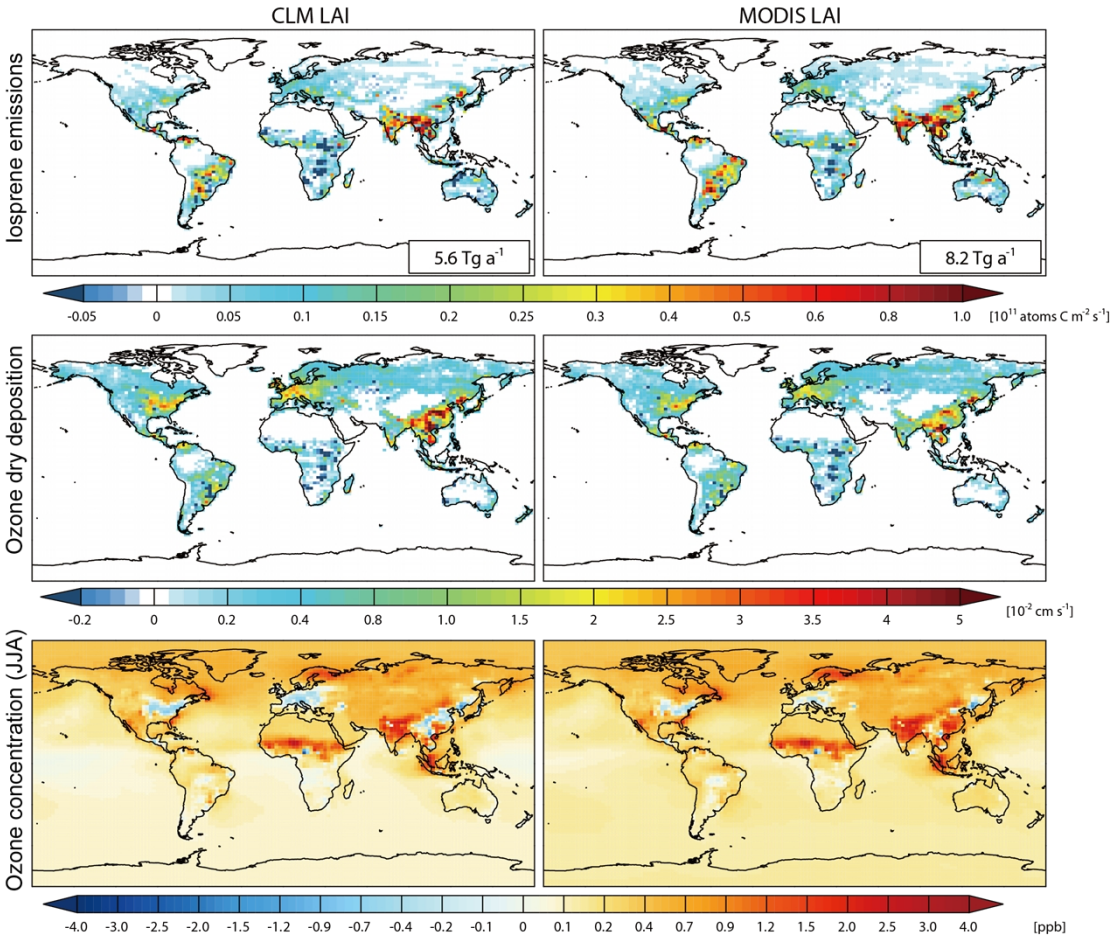

Figure S3. Anthropogenic nitrogen deposition induced changes in biogenic isoprene emissions (top panels, with annual totals shown inset), ozone dry deposition velocity (middle panels), and mean surface ozone concentration for June-July-August (bottom panels) as simulated by GEOS-Chem for 2009. Model results based on the CLM LAI (left panels) are compared to those based on the adjusted MODIS LAI (right panels). The largest differences occur over East Asia and South Asia where the CLM LAI values are distinctly biased high relative to MODIS LAI measurements.

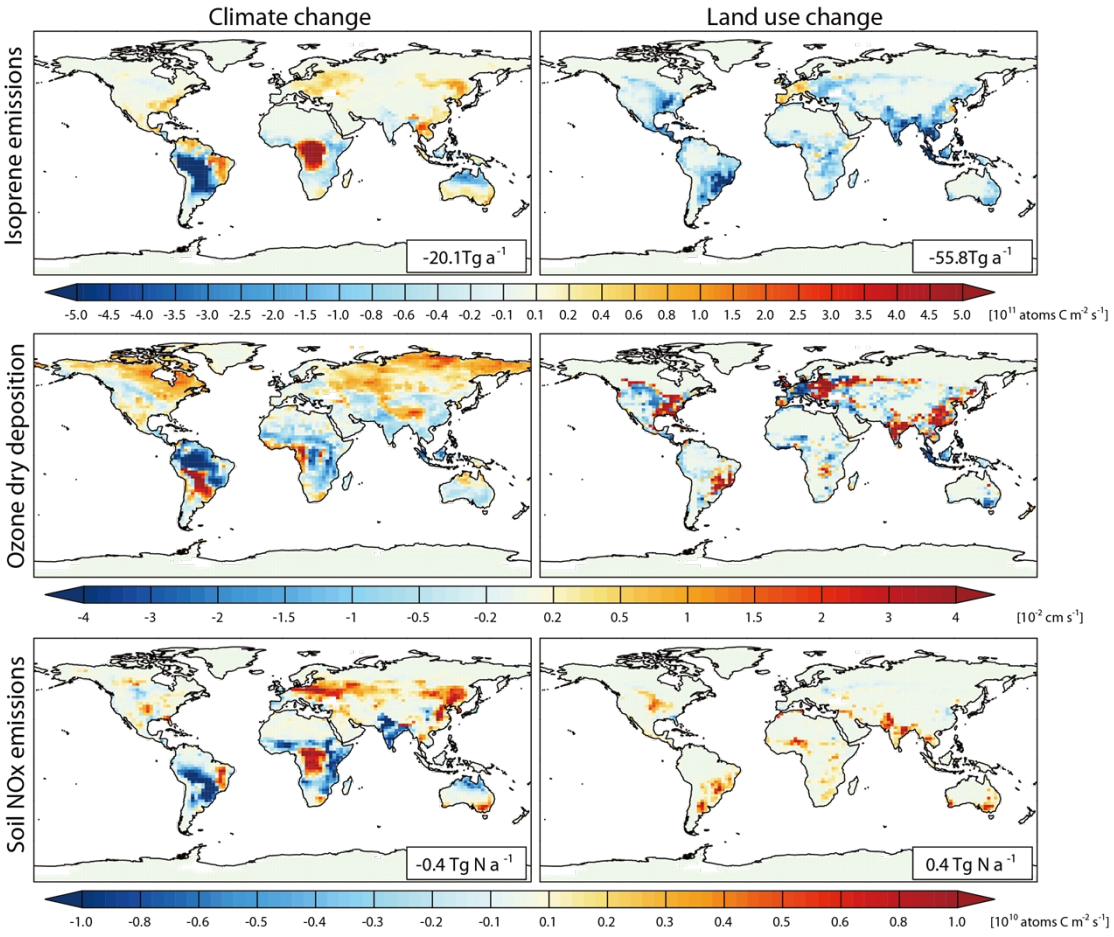

Figure S4. Changes in biogenic isoprene emissions (top panels), ozone dry deposition velocity (middle panels), and soil NO_x emissions (bottom panels) driven by the past 20-year climate change (2006-2010 vs. 1986-1990; left column) and historical land use change (2000 vs. 1860; right column). Annual global emission totals are shown inset.

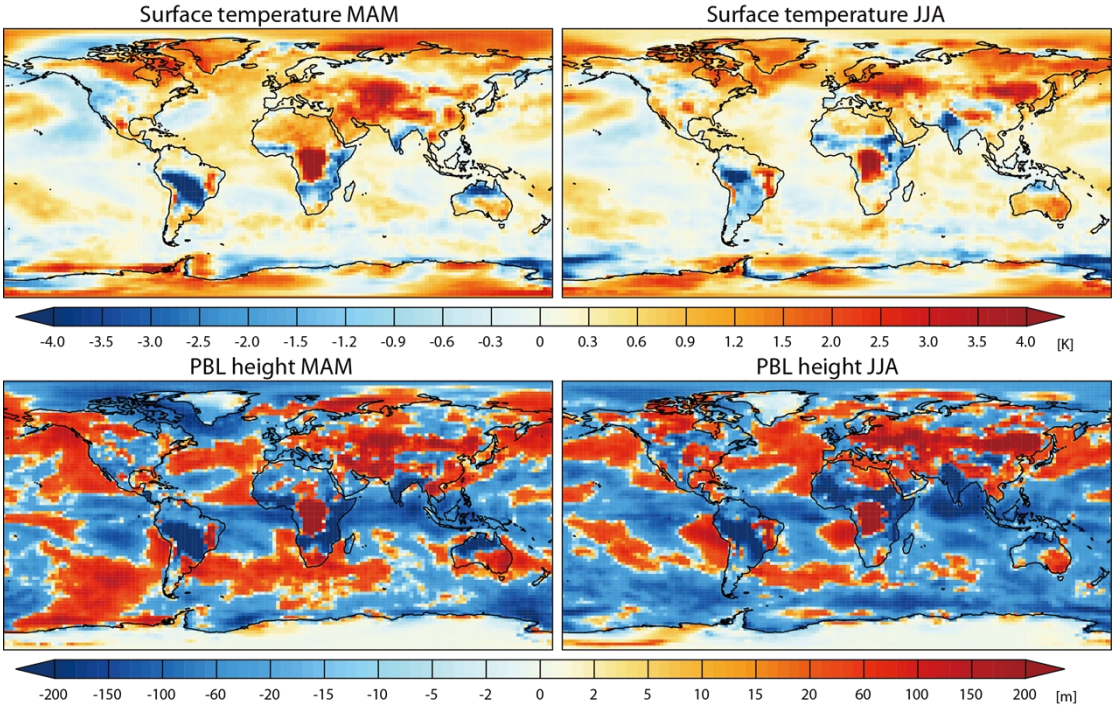

Figure S5. Changes in daytime mean (8:00-18:00 local time) surface temperature (top panels) and planetary boundary height (PBL) (bottom panels) from 1986-1990 to 2006-2010 averaged over March-April-May (left) and Jun-July-August (right).