**Data files and variable descriptions for all Figures in the manuscript titled**

**“How are Divergent Global Emission Trends Influencing Long-range Transported Ozone to North America”**

The file “***Figures\_1-8\_data.tar***”: this tar file contains netcdf data files used to create Figures 1, 3-8 and supplemental figures.

**Notes**:

1. All netcdf files (with a .ncf extension) are on the CMAQ Northern Hemisphere domain that is set on a polar stereographic projection. The domain is discretized with 187x187 grid with a 108km resolution.
2. In figures that only depict portions of the continental U.S. and surrounding regions, the subdomain column and row specification relative to the hemispheric domain are: COL (65 to 125) and ROWS ( 30 to 65)
3. Unless specified the netcdf files with information of sensitivities, mixing ratios, and source-region contributions estimates represent seasonal mean values for 0-2km altitude average.
4. Sensitivity coefficients are only computed for the calendar year 2006. These are repeated in all files. The variable nomenclature for the sensitivity coefficients is as follows:
	* O3\_<REG>NX : first-order sensitivity of O3 to NOx emissions in region <REG>
	* O3\_<REG>VC : first-order sensitivity of O3 to VOC emissions in region <REG>
	* O3\_PVO3: first-order sensitivity of O3 to O3 specified in top-most model layer
	* O3\_GLBNX: first-order sensitivity of O3 to domain-wide NOx emissions
	* O3\_GLBVC: first-order sensitivity of O3 to domain-wide VOC emissions
	* O3\_2GLNX: second-order sensitivity of O3 to domain-wide NOx emissions
	* O3\_2GLVC: second-order sensitivity of O3 to domain-wide VOC emissions
	* O3\_XNXVC: second order cross sensitivity to domain wide NOx and VOC emissions
5. The <REG> abbreviations in the sensitivity variable names are described further in the details related to Figure 1, with the exception for 3 regions that were consolidated: EUR covers EUR+RUS; EAS covers EAS+SEA; NAF covers NAF+MDE
6. All netcdf files contain several extra diagnostic variables that are not illustrated in the Figures or discussed in the manuscript. These are provided for completeness. The specific variables used to create the figures are described below for each file.

**Figure1\_HTAP\_Source\_Regions\_PolSte.final.ncf**: This netcdf file describes the geographic extent of various source regions on the Northern Hemisphere model domain and grid structure. (1) North America (NAM), (2) Europe and Russia (EUR+RUS), (3) East and Southeast Asia (EAS+SEA), (4) South Asia (SAS; the Indian subcontinent), (5) Northern Africa and the Middle East (NAF+MDE), (6) Central America (CAM), and (7) The rest of the geographic domain (OTH).

**Figure 2**: This figure illustrates trends in different percentiles of the DM8O3 for the 1990-2010 period at different altitudes. The trends are derived from the 3D model output concentration files. These files are too large to share but can be provided on request.

**Figure3\_4a\_5\_Spring\_mean\_2006\_NAM\_O3sensitivity\_HEMIS108km.ncf**

* O3\_recon\_1st: sum of first order NOx and VOV sensitivities
* The fractions for each region can then be estimated as: (O3\_REGNX+O3\_REGVC)/O3\_recon\_1st
* O3\_Bkgr\_1st: defined as amount of O3 transported to NAM from the other source regions and due to stratosphere-troposphere exchange (Figure 4)
* <REG>\_frac: fractional contribution of region to estimated background (Figure 5)

**Figure4b\_6\_S1\_Summer\_mean\_2006\_NAM\_O3sensitivity\_HEMIS108km.ncf**

Variable definitions same ad for file above except that these represent summer mean values for 2006.

**Figure4c\_Spring\_mean\_2006\_NAM\_O3sensitivity\_Layer1\_LRTfrac\_HEMIS108km.ncf**

O3\_Bkgr\_1st: estimated NAM O3 background for layer 1 (surface layer) during Spring 2006

**Figure4d\_Summer\_mean\_2006\_NAM\_O3sensitivity\_Layer1\_LRTfrac\_HEMIS108km.ncf**

O3\_Bkgr\_1st: estimated NAM O3 background for layer 1 (surface layer) during Summer 2006

**Figure7a\_Spring\_mean\_1990\_LRT\_NAM\_O3sensitivity\_HEMIS108km.ncf**

O3\_1st\_LRT\_norm: Estimated long-range transport O3 to North America from the different source regions for Spring 1990.

**Figure7b\_Spring\_mean\_2000\_LRT\_NAM\_O3sensitivity\_HEMIS108km.ncf**

O3\_1st\_LRT\_norm: Estimated long-range transport O3 to North America from the different source regions for Spring 2000.

**Figure7c\_Spring\_mean\_2010\_LRT\_NAM\_O3sensitivity\_HEMIS108km.ncf**

O3\_1st\_LRT\_norm: Estimated long-range transport O3 to North America from the different source regions for Spring 2010.

**Figure7d\_1990-2010\_Spring\_avg\_LRT\_bkgrnd\_NAM\_trend\_HEMIS108km.ncf**

* O3\_1st\_LRT\_norm\_S: Estimated trend in long-range transported O3 to North America for the 1990-2010 period. The trend is estimated as a linear regression of the seasonal mean long-range transported amounts for each of the 21-years in the 1990-2010 period at each grid cell of the North American subdomain.
* O3\_1st\_LRT\_norm\_R: the corresponding R2 value of the linear regression.

**Figure8\_Spring\_mean\_1990\_LRTconc\_NAM\_O3sensitivity\_HEMIS108km.ncf**

CAM\_LRTF: Estimated long-range transported O3 from CAM to North America during Spring 1990

EUR\_LRTF: Estimated long-range transported O3 from EUR+RUS to North America during Spring 1990

NAF\_LRTF: Estimated long-range transported O3 from NAF+MDE to North America during Spring 1990

EAS\_LRTF: Estimated long-range transported O3 from EAS+SEA to North America during Spring 1990

SAS\_LRTF: Estimated long-range transported O3 from SAS to North America during Spring 1990

OTH\_LRTF: Estimated long-range transported O3 from OTH to North America during Spring 1990

**Figure8\_Spring\_mean\_2010\_LRTconc\_NAM\_O3sensitivity\_HEMIS108km.ncf**

CAM\_LRTF: Estimated long-range transported O3 from CAM to North America during Spring 2010

EUR\_LRTF: Estimated long-range transported O3 from EUR+RUS to North America during Spring 2010

NAF\_LRTF: Estimated long-range transported O3 from NAF+MDE to North America during Spring 2010

EAS\_LRTF: Estimated long-range transported O3 from EAS+SEA to North America during Spring 2010

SAS\_LRTF: Estimated long-range transported O3 from SAS to North America during Spring 2010

OTH\_LRTF: Estimated long-range transported O3 from OTH to North America during Spring 2010

**Figure9a\_timeseries\_ptile\_LRTfrac\_NAM\_Spring.xlsx**

**Figure9b\_timeseries\_ptile\_LRTfrac\_NAM\_Summer.xlsx**

These excel files contain the 5th, 50th (median), and 95th percentiles of the fractional contribution of each source region to the estimated long-range transported O3 to the North American subdomain represented within the bounds: COL (65 to 125) and ROWS ( 30 to 65) of the CMAQ Northern Hemisphere domain. The top row in the files lists the variable names with the following convention:

<REG>\_5: 5th percentile

<REG>\_5: 50th percentile

<REG>\_95: 95th percentile

e.g., EUR\_50 is the median value of the fractional contribution to LRT O3 across the 1620 grid cells in the North American subdomain shown in the illustrations.

**Figure10\_IntShippingEmissions\_EDGAR.xlsx**

This excel file includes estimates of NOx emissions from shipping emissions within the Northern Hemisphere CMAQ domain for each year of 1990-2008 period. The emission estimates are based on the EDGAR inventory.

FigureS2\_Winter\_mean\_2006\_NAM\_O3sensitivity\_HEMIS108km.ncf

FigureS3\_Fall\_mean\_2006\_NAM\_O3sensitivity\_HEMIS108km.ncf