Supplementary Material

# Correlation of ozone and Great Plains low level jet (GPLLJ)

Here we seek to examine more closely the causes for the pattern in the third empirical orthogonal function (EOF3) of daily JJA maximum daily 8-hour average (MDA8) ozone over the eastern United States. To that end, we calculate the correlation of JJA MDA8 ozone and the GPLLJ wind speed, which we define as the daily mean meridional wind speed at 850 hPa averaged over a 10°×5° box in the southern part of the Great Plains (26.25°-36.25°N, 101.25°-96.25°W) as indicated by the red rectangle in Fig. S1. This region corresponds to the core of the GPLLJ (Zhu and Liang, 2013). We follow the approach of Zhu and Liang (2013) but use daily data instead of monthly data since our focus is on the daily variability. Figure S1 shows the relationship of daily detrended and deseasonalized MDA8 ozone concentration and the GPLLJ wind speed, with negative correlations in the South Central and positive correlations in the Great Lakes and East coast regions. Our result is similar to that of Zhu and Liang (2013) but with much lower correlations due to the finer temporal resolution. The figure shows that a strong GPLLJ ventilates Texas and the central United States, but is associated with increased ozone in the Northeast and Southeast.



Figure S1. Correlations (in color) of the 1980-2012 timeseries of daily JJA MDA8 ozone anomalies across the United States and the daily meridional wind speeds at 850 hPa averaged over the region indicated by the red rectangle. Ozone values have been detrended and deseasonalized. Black arrows denote the composite 850 hPa wind anomalies on days when the meridional windspeed within the red rectangle is greater than the JJA median GPLLJ over this time period (6.4 m s-1).

# Definition of Bermuda High west edge



Figure S2. The definition of Bermuda High west edge. The bold blue solid curve denotes the climatological 1560-gpm isoline in June-July-August (JJA) from 1980 to 2012. The dashed curve line is the climatological *u* = 0 ms-1 ridge line at 850 hPa for the same time period. The intersection point, as denoted by the red points, is defined as the Bermuda High west edge, as defined in Li et al. (2011). The thin solid curves represent the mean JJA 1560-gpm isolines in different years from 1980 to 2012. The geopotential heights shown in this figure have been adjusted, as described in Sect. 6.

# Linear trend of sea level pressure (SLP) from 1980 to 2012



Figure S3. (a) The linear trend (Pa a-1) of mean JJA sea level pressure (SLP) over much of North America and the North Atlantic. Red dots indicate gridboxes where the trend is significant (p 0.05). (b) Relationship of the longitude of the Bermuda High west edge (unscaled BH-Lon) as defined by Li et al. (2011) and mean JJA SLP averaged over the Bermuda High domain (100°W~40°W, 20°N~40°N) during the 1948-2012 timeframe. Each point represents one summer. The correlation coefficient *r* is shown inset.

# Variation of the standard deviation of BH-Lon as a function of the isoline of geopotential height



Figure S4. Standard deviation over the 1980-2012 time period of the mean JJA longitudes of the Bermuda High west edge, as defined by different isolines of the geopotential height at 850 hPa. The plot shows BH-Lon adjusted for the uniform changes in geopotential height, as described in Sect. 6.

# Correlation of ozone and locations of Bermuda High west edges



Figure S5. Correlations of the mean JJA MDA8 ozone in the eastern United States and the location of the Bermuda High west edge over the 1980-2012 time period. Ozone concentrations have been detrended as described in text. Positive values indicate increasing ozone with westward or northward shift of the longitude of the Bermuda High west edge. The top panels (a and b) show results for those summers when the west edge was located in the West Regime, with the 1560-gpm crossing the 850 hPa wind ridge line west of 85.4°W. The bottom panels (c and d) show results for the East Regime, when the 1560-gpm BH-Lon crossed the 850 hPa wind ridge line east of 85.4°W. The location of 85.4°W is denoted by the blue arrow in Panel a. Red and black dots indicate those gridboxes where the slope is significant at the 0.10 level. For more details on the definition of the Bermuda High west edge for each regime, see text.