Supplement to "Lightning NO$_2$ simulation over the Contiguous US and its effects on satellite NO$_2$ retrievals"

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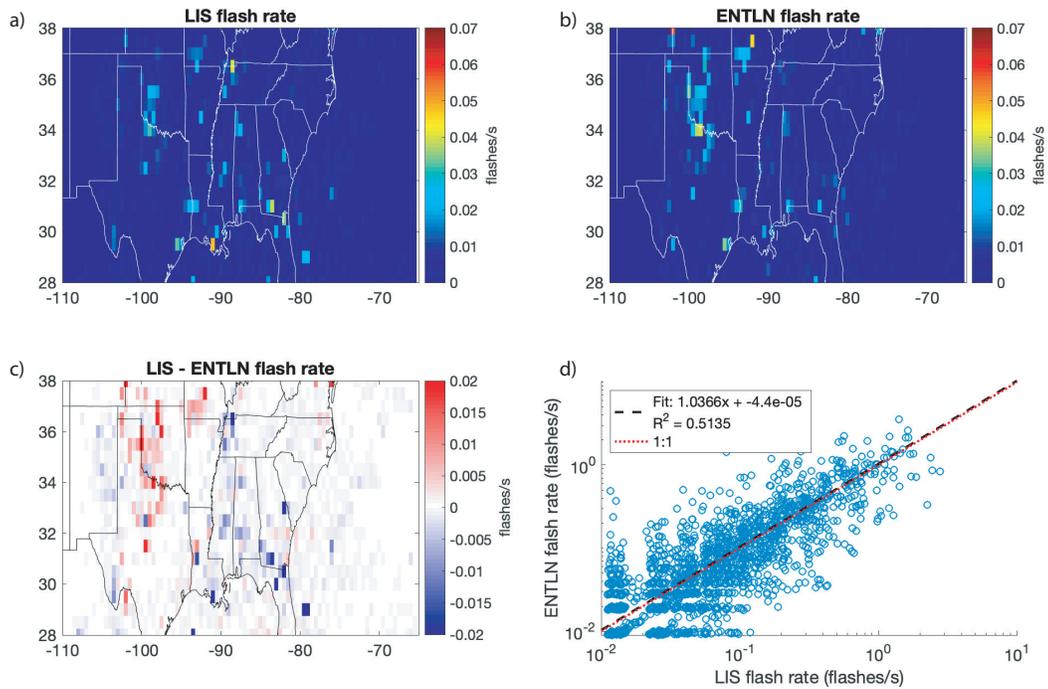
Figure S1: Comparison between flash rates observed by ENTLN and Lightning Imaging Sensor (LIS). **(a,b)** shows the spatial pattern of lightning flash rates averaged from May 13 to Jun 23 2012 measured by LIS **(a)** and ENTLN **(b)**. The plot region covers 20°N - 38°N and 110°W - 65°W. **(c,d)** are corresponding absolute difference and scatter plots between LIS and ENTLN.
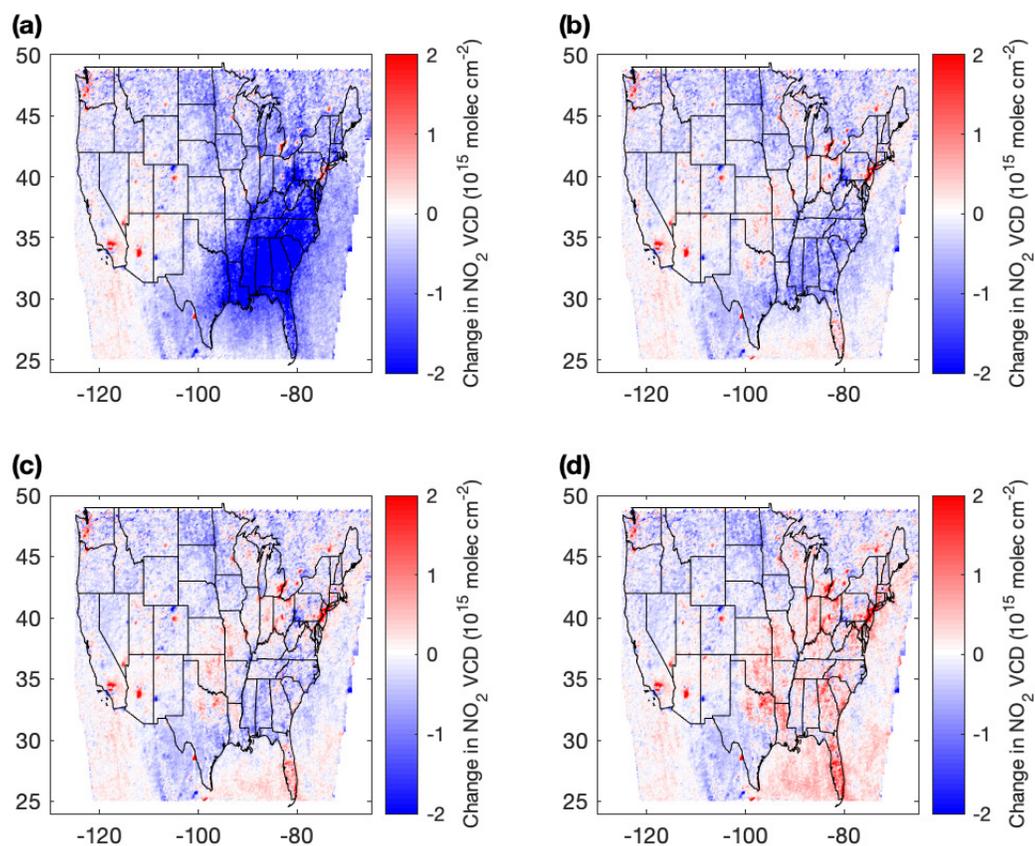
Figure S2: Difference in NO_2 VCD between BEHR retrievals and WRF-Chem **(a)** without LNO_x and with LNO_x production rate of **(b)** 400 mol NO flash^{-1}, **(c)** 500 mol NO flash^{-1} and **(d)** 665 mol NO flash^{-1}.
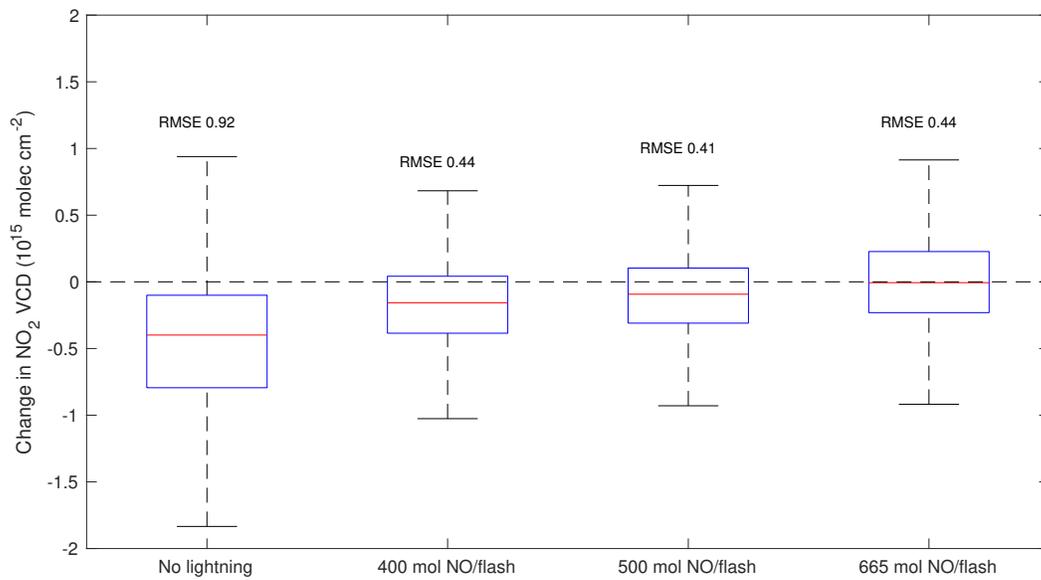
Figure S3: Box plot of difference in NO_2 VCD between BEHR retrievals and WRF-Chem with varied LNO_x production rate of 0, 400, 500 and 665 mol NO flash^{-1}. The corresponding root-mean-square errors (RMSE) are shown above.
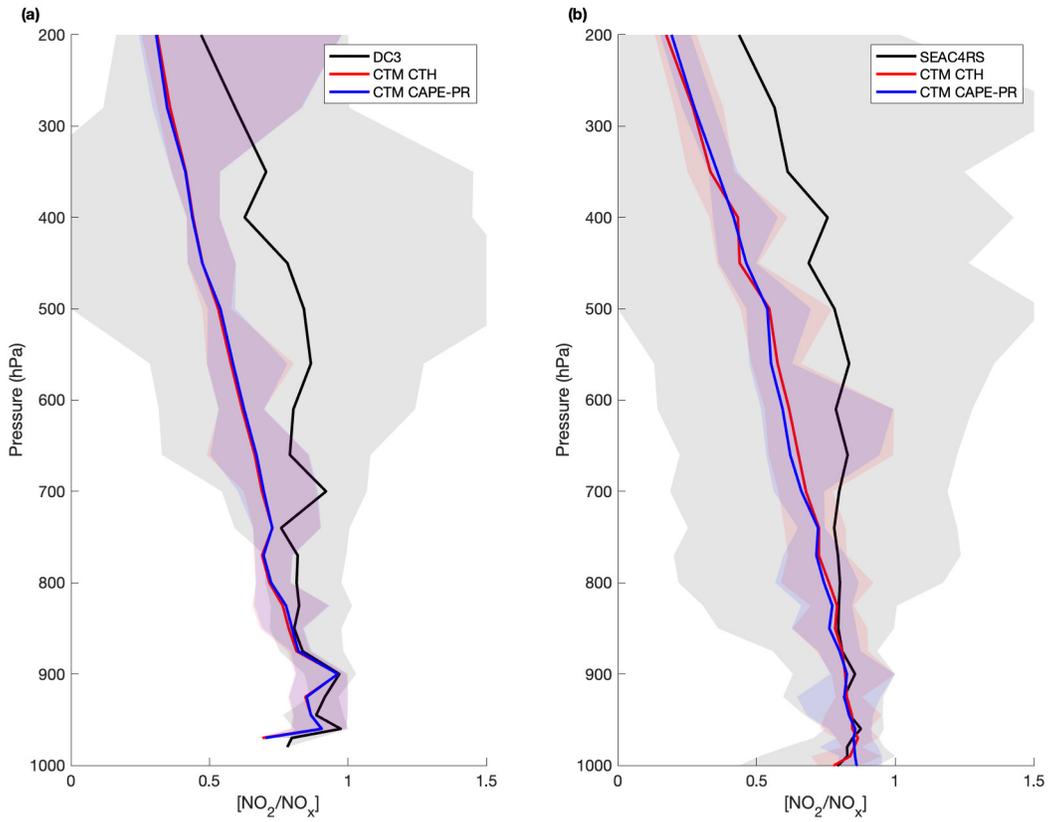
Figure S4: Comparison of WRF-Chem and aircraft $[NO_2/NO_x]$ profiles from the **(a)** DC3, **(b)** SEAC4RS campaigns.The solid line is the median of all profiles and the shaded areas are between 10th and 90th percentiles for each binned level. Aircraft measurements are shown in black, WRF-Chem using CTH lightning parameterization in red and WRF-Chem using CAPE-PR lightning parameterization in blue.