MAX-DOAS NO$_2$ Trop. VCD [10$^{15}$ molecules cm$^{-2}$] vs. OMI NO$_2$ Trop. VCD [10$^{15}$ molecules cm$^{-2}$]

Satellite pixel data:
- 0-75km (p: 10554, d: 513)
  - Pixel: $R^2=0.17$, slope=0.37, intercept=2.1
  - Daily averaged: $R^2=0.19$, slope=0.37, intercept=2.1

OMI SO$_2$ Trop. VCD [10$^{15}$ molecules cm$^{-2}$] vs. MAX-DOAS SO$_2$ Trop. VCD [10$^{15}$ molecules cm$^{-2}$]

Satellite pixel data:
- 0-75km (p: 10554, d: 513)
  - Pixel: $R^2=0.19$, slope=0.37, intercept=2.1
  - Daily averaged: $R^2=0.17$, slope=0.34, intercept=2.1

Satellite daily averaged data:
- 0-20km (p: 629, d: 243)
  - Pixel: $R^2=0.66$, slope=0.73, intercept=6.2
  - Daily averaged: $R^2=0.62$, slope=0.75, intercept=4.8

Satellite daily averaged data:
- 0-50km (p: 5036, d: 459)
  - Pixel: $R^2=0.40$, slope=0.55, intercept=7.5
  - Daily averaged: $R^2=0.37$, slope=0.54, intercept=7.6
Figure S1: Tropospheric VCDs of NO$_2$ (a), SO$_2$ (b) and HCHO (c) derived from OMI observations for the pixel with the distance bins of 0-10km, 0-20km, 0-50km and 0-75km away from the Wuxi MAX-DOAS station are plotted against the coincident MAX-DOAS results. Only the OMI data for the eCF<30% are included. For HCHO, only the data for VCD fit error < 7×10$^{15}$ molecules cm$^{-2}$ are included. The grey and black dots show the data for each satellite pixel and daily averaged data (averaged during two hours around the OMI overpass time), respectively. The corresponding numbers of the pixels (p) and days (d) are shown in each subfigure. The linear regression lines and the parameters are shown in each subfigure for the pixel data (blue lines) and daily averaged data (red lines), respectively.

(a) OMI
(b) GOME-2A
Figure S2: HCHO tropospheric VCDs for OMI pixels for eCF<30% are plotted against those derived from MAX-DOAS observations with the color map of eCF; the linear regression parameters are acquired for eCF<30% and for eCF<10%, respectively. (b) Scattered plots are same as in (a)
Figure S3: For eCF<30%, weekly cycles of VCDs of NO₂ (a), SO₂ (b) and HCHO (c) derived from different satellite instruments, corresponding coincident MAX-DOAS measurements. In all the subfigures the red and light red lines indicate the improved OMI tropospheric VCDs using the SFs from MAX-DOAS and the original VCDs from OMI products, respectively. The numbers of the available days in each two-month bin from different satellite products are shown in the bottom of each subfigure.

(a)  

Dec. 10, 2011          Nov. 20, 2013
Figure S4: (a) visual images from MODIS on the Aqua satellite on the six days with strong aerosol pollutants; (b) AODs from MAX-DOAS and the nearby Taihu AERONET station on the six days.

Figure S5: Averaged aerosol extinction profiles and SF of NO$_2$, SO$_2$ and HCHO derived from all MAX-DOAS measurements under cloud-free sky conditions. The dashed curves indicate the corresponding averaged SF derived from CTM simulations for NO$_2$ (TM4), SO$_2$ (IMAGES) and HCHO (IMAGES).