(a)

satellite pixel data : ⁎ pixel data — linear fit
satellite daily aveveraged data: ● daily averaged data — linear fit

0-10km (p:120 d: 98)

pixel: R^2=0.66, slope=0.73, intercept=6.2

daily averaged: R^2=0.68, slope=0.75, intercept=5.8

0-20km (p: 629 d: 243)

pixel: R^2=0.62, slope=0.73, intercept=4.8

daily averaged: R^2=0.64, slope=0.75, intercept=4.2

0-50km (p: 5036 d: 459)

pixel: R^2=0.40, slope=0.55, intercept=7.5

daily averaged: R^2=0.46, slope=0.51, intercept=7.6

0-75km (p: 6501 d: 477)

pixel: R^2=0.37, slope=0.54, intercept=7.6

daily averaged: R^2=0.42, slope=0.49, intercept=7.7

OMI NO_2 Trop. VCD [10^{15} molecules cm^{-2}]

MAX-DOAS NO_2 Trop. VCD [10^{15} molecules cm^{-2}]

(b)

0-10km (p:186 d: 149)

pixel: R^2=0.17, slope=0.38, intercept=2.6

daily averaged: R^2=0.23, slope=0.42, intercept=1.7

0-20km (p: 638 d: 268)

pixel: R^2=0.21, slope=0.44, intercept=0.9

daily averaged: R^2=0.27, slope=0.42, intercept=1.5

0-50km (p: 4763 d: 467)

pixel: R^2=0.19, slope=0.37, intercept=2.1

daily averaged: R^2=0.34, slope=0.36, intercept=1.5

0-75km (p: 10554 d: 513)

pixel: R^2=0.17, slope=0.34, intercept=2.1

daily averaged: R^2=0.34, slope=0.34, intercept=1.1

OMI SO_2 Trop. VCD [10^{15} molecules cm^{-2}]
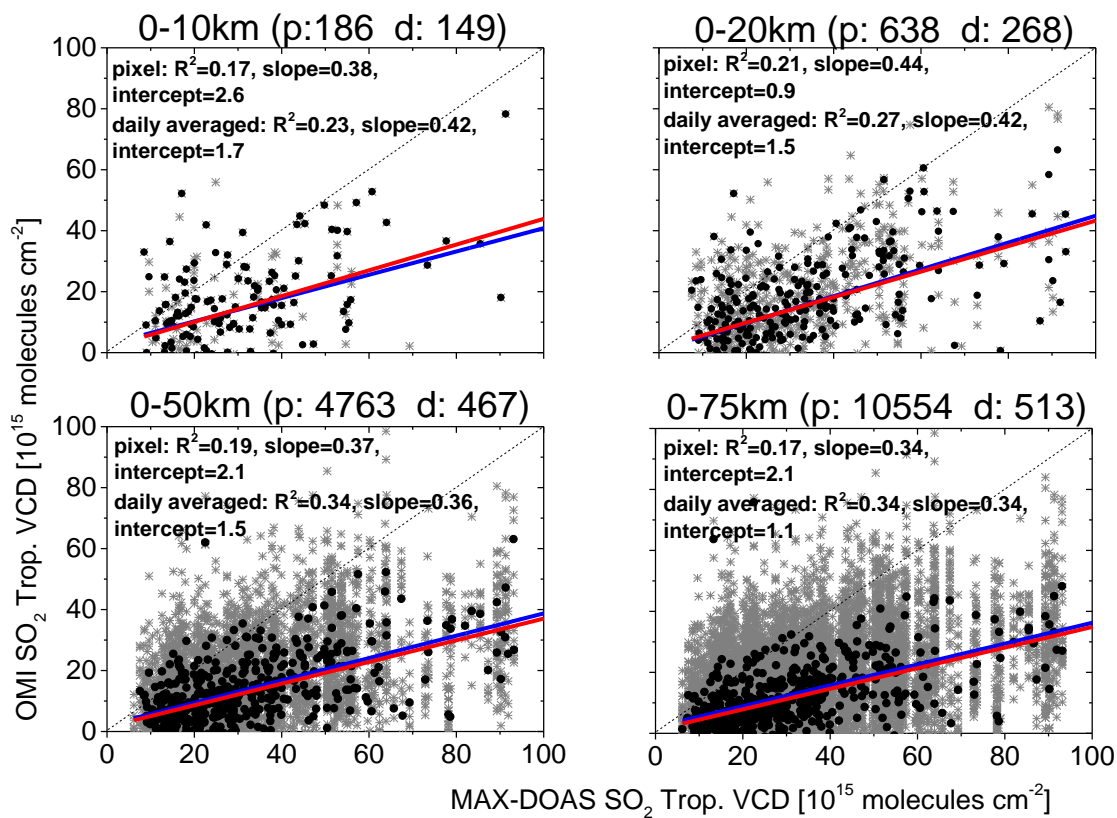
MAX-DOAS SO_2 Trop. VCD [10^{15} molecules cm^{-2}]

(c)
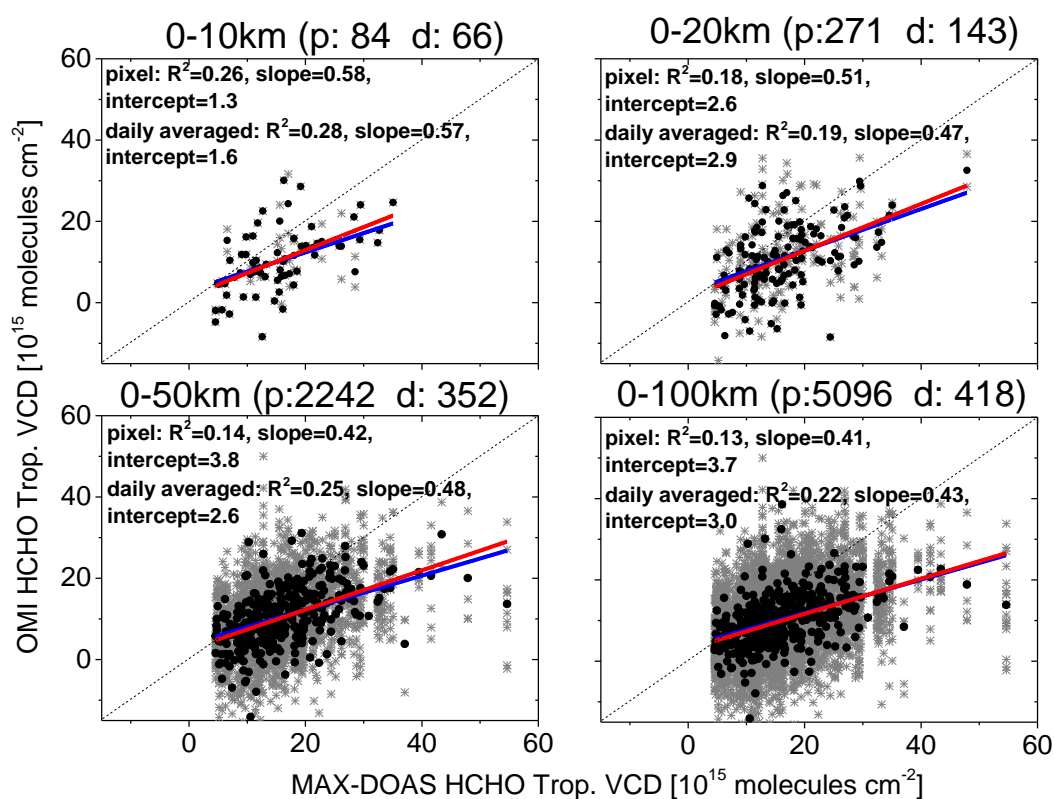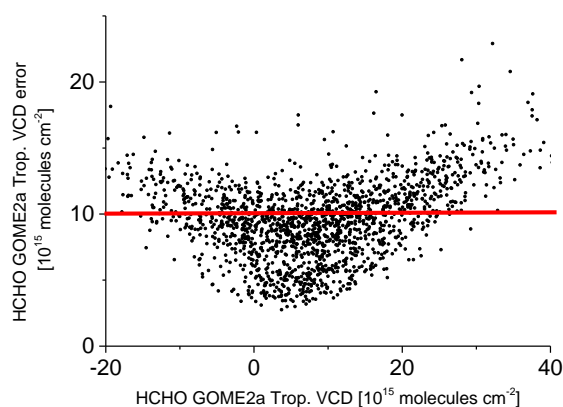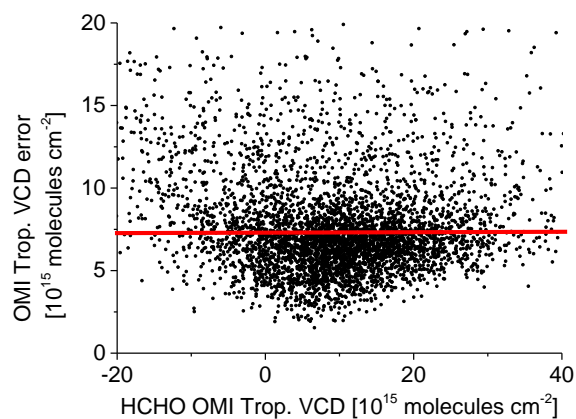

Figure S1: Tropospheric VCDs of NO₂ (a), SO₂ (b) and HCHO (c) derived from OMI observations for the pixel with the distance bins of 0-10km, 0-20km, 0-50km and 0-75km away from the Wuxi MAX-DOAS station are plotted against the coincident MAX-DOAS results. Only the OMI data for the eCF<30% are included. For HCHO, only the data for VCD fit error < 7×10¹⁵ 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
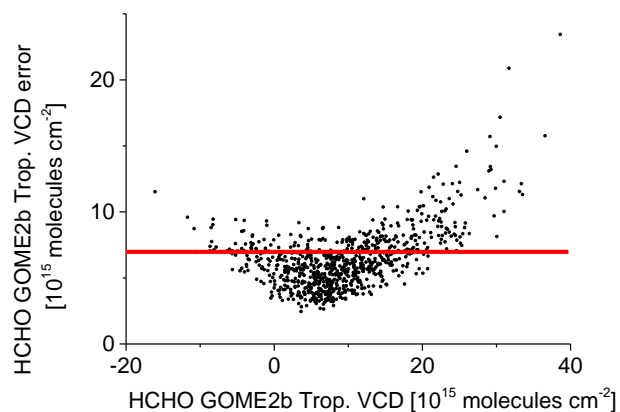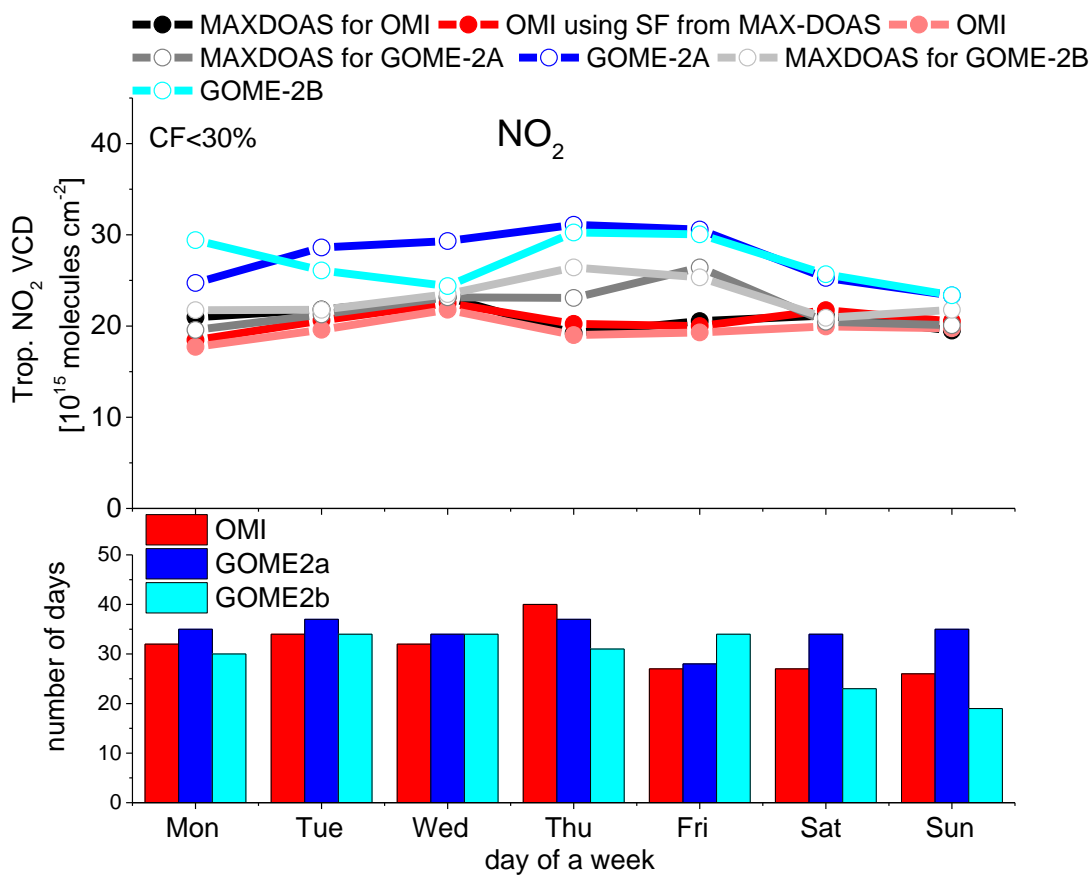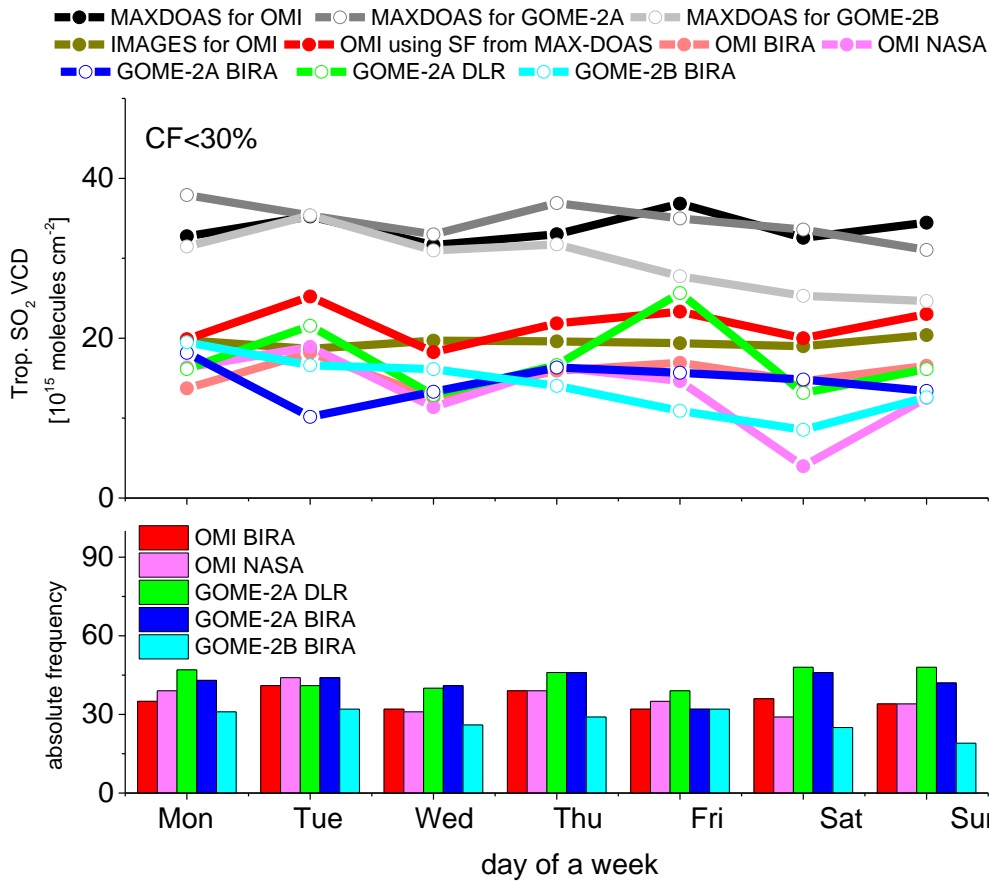
(b) GOME-2A

(c) GOME-2B

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)
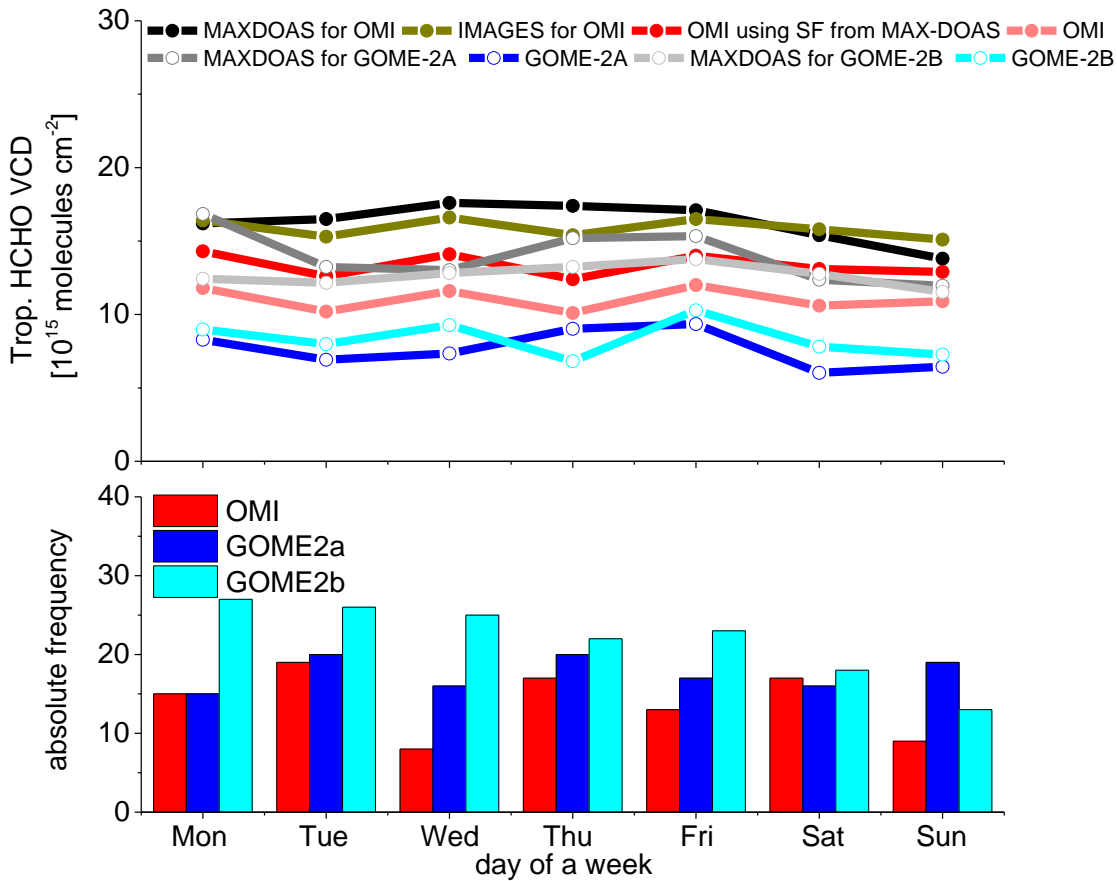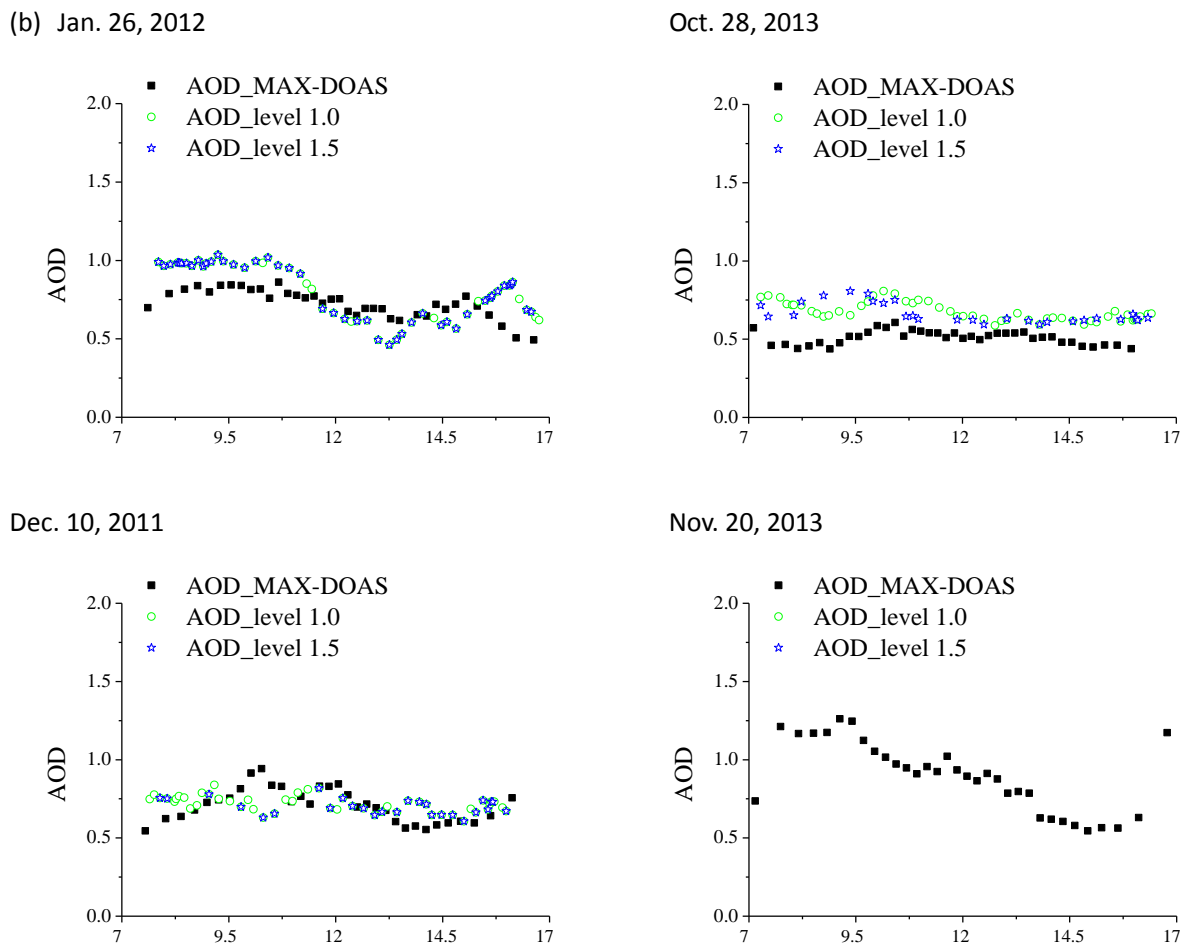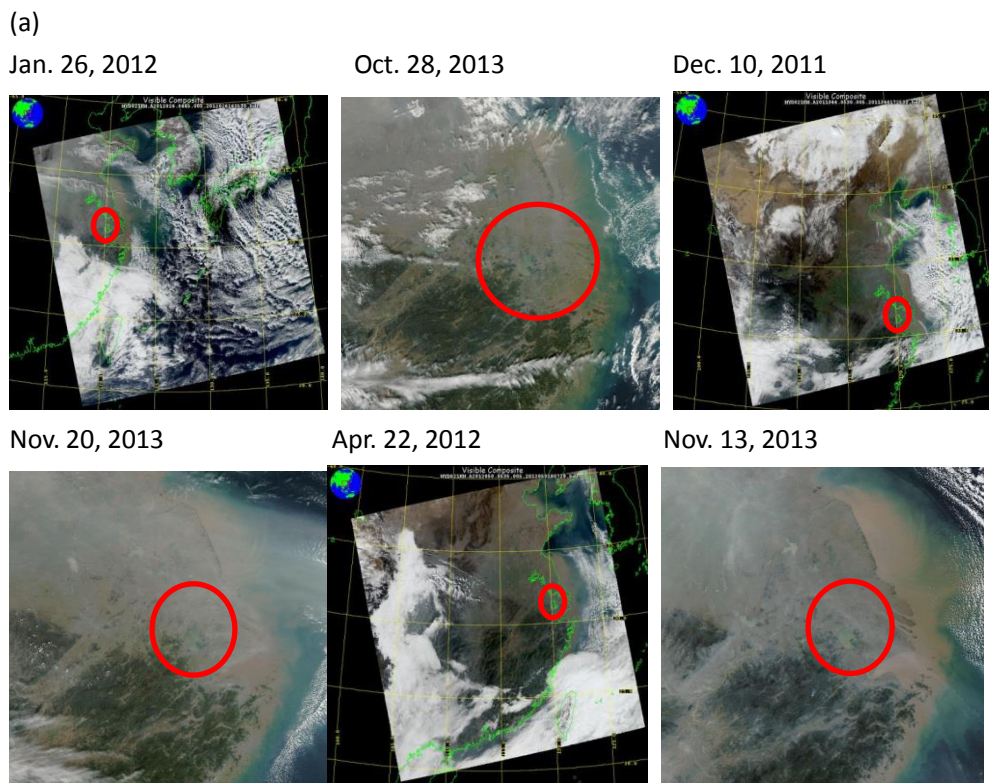
(a)

(b)

(c)

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)

Jan. 26, 2012   Oct. 28, 2013   Dec. 10, 2011

Nov. 20, 2013   Apr. 22, 2012   Nov. 13, 2013

(b) Jan. 26, 2012

Oct. 28, 2013

Dec. 10, 2011

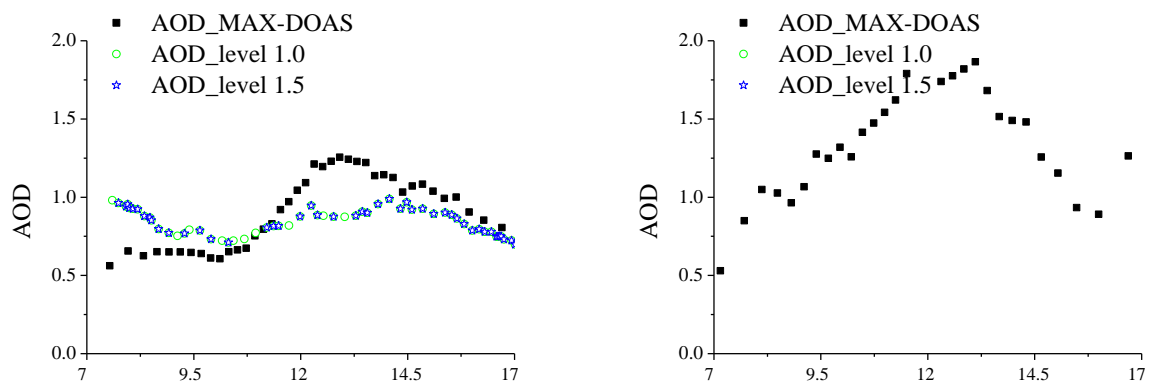Nov. 20, 2013

5

Apr. 22, 2012

Nov. 13, 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.
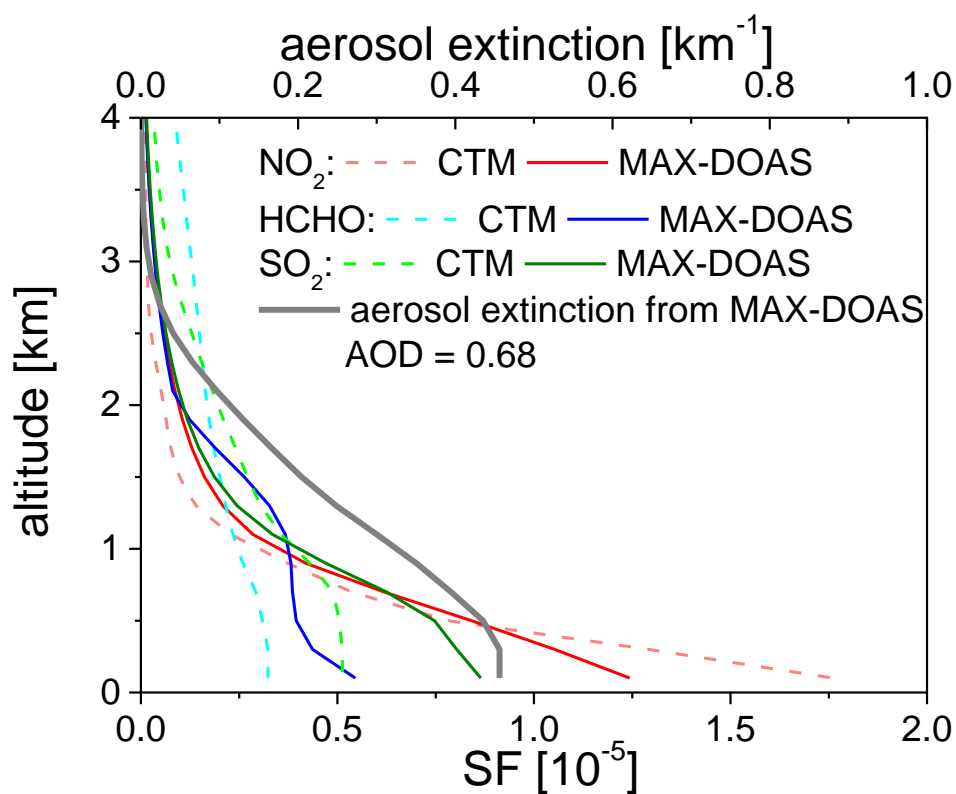

Figure S5: Averaged aerosol extinction profiles and SF of NO_2, SO_2 and HCHO derived from all MAX-DOAS measurements under cloud-free sky conditions. The dashed curves indicate the corresponding averaged SF derived from CTM simulations for NO_2 (TM4), SO_2 (IMAGES) and HCHO (IMAGES).