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Tropospheric ozone variability during the East Asian summer monsoon as observed by satellite (IASI), aircraft (MOZAIC) and ground stations

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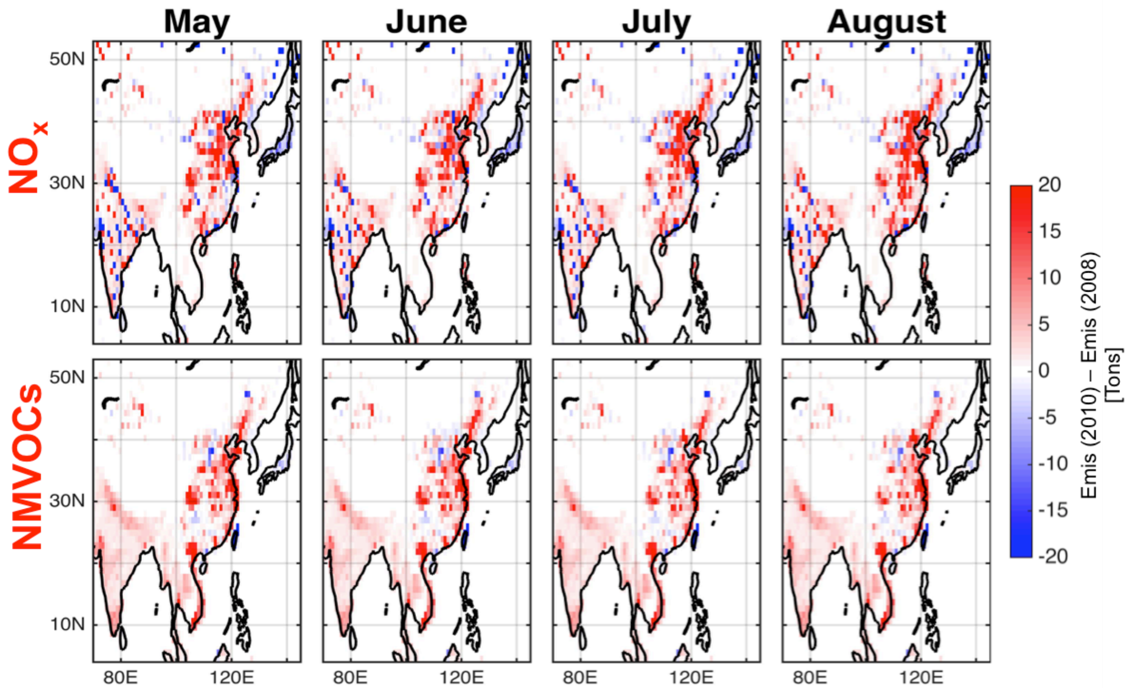

Fig S1. Change (in tons specie) between 2010 and 2008 of NOx (upper panel) and NMVOCs (lower panel) emissions as derived from EDGAR-HTAP.

Table S1. Indian ground stations specific location and type

Station name	**Longitude**	**Latitude**	**Type**
Hyderabad	78.48	17.37	Urban
Udaipur	73.68	24.58	Urban
Jabalpur	79.93	23.17	Urban

Table S2. Chinese ground stations specific location and type in the North China Plain (N1 to N7) and Pearl River Delta (P1 to P13). The station label is used in Figs. S1 and S2.

Station label	Station name	Longitude	Latitude	Type
N1	BD	115.52	38.87	Urban
N2	CZ	116.81	38.28	Urban
N3	TS	118.16	39.62	Urban
N4	SJZ	114.54	38.03	Urban
N5	BJ	116.37	39.97	Urban
N6	LF	116.75	39.6	Suburban
N7	XL	117.48	40.4	Rural
P1	Chengzhong	112.47	23.05	Urban
P2	Jinjuzui	113.26	22.82	Urban
P3	Huijingcheng	113.1	23	Urban
P4	Donghu	113.08	22.59	Urban
P5	Tangjia	113.63	22.42	Urban
P6	Haogangxiaoxue	113.77	23	Urban
P7	Jinguowan	114.38	22.94	Rural
P8	Xiapu	114.4	23.08	Urban
P9	Liyuan	114.09	22.55	Urban
P10	Luhugongyuan	113.27	23.15	Urban
P11	Nanshawanqingsha	113.62	22.72	Rural
P12	Tianhu	113.62	23.65	Rural

The NCP surface ozone was measured with a Model 49i or 49c ozone analyzer from Thermo Environmental Instruments (TEI) Inc. with a precision of 1 ppbv. Multipoint calibrations of the O_3 analyzer were conducted using a zero air supplier (Model 111) and a calibrator (TE 49c PS).

The O_3 at the PRD stations have been measured using an EC9810B ozone analyzer (Ecotech Co., Australia) based on the UV-absorption method and the Lambert–Beer law.

The O_3 at the Indian stations was measured using Model EC-9810 ozone analyzer (Ecotech, Australia) (Surendran et al., 2015)

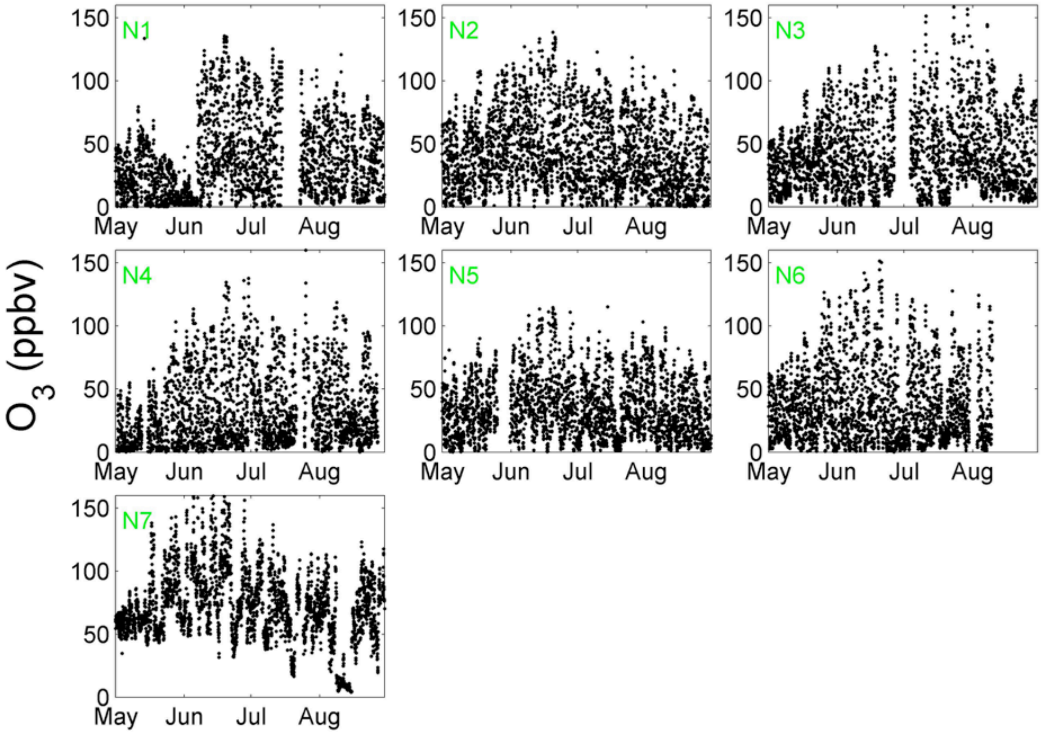

Figure S2. Hourly observations of surface O_3 at the North China Plain stations during the EASM of 2011.

Figure 2 has suggested that the NCP region is not affected by the EASM as the rest of China, and we had a general persistence of high tropospheric O_3 column values. Figure S1 shows that the urban/suburban NCP stations (N1 to N6) have high diurnal variations with recurrent near-zero O_3 values suggesting high O_3 losses. This is due to the depletion of O_3 through titration by the freshly emitted NO which is common in the shallow nocturnal boundary layer in polluted regions (Duncan et al., 2008; Sillman et al., 1990). These stations show a small decrease from June to July due to the weak effect of the EASM on surface O_3 over this region.

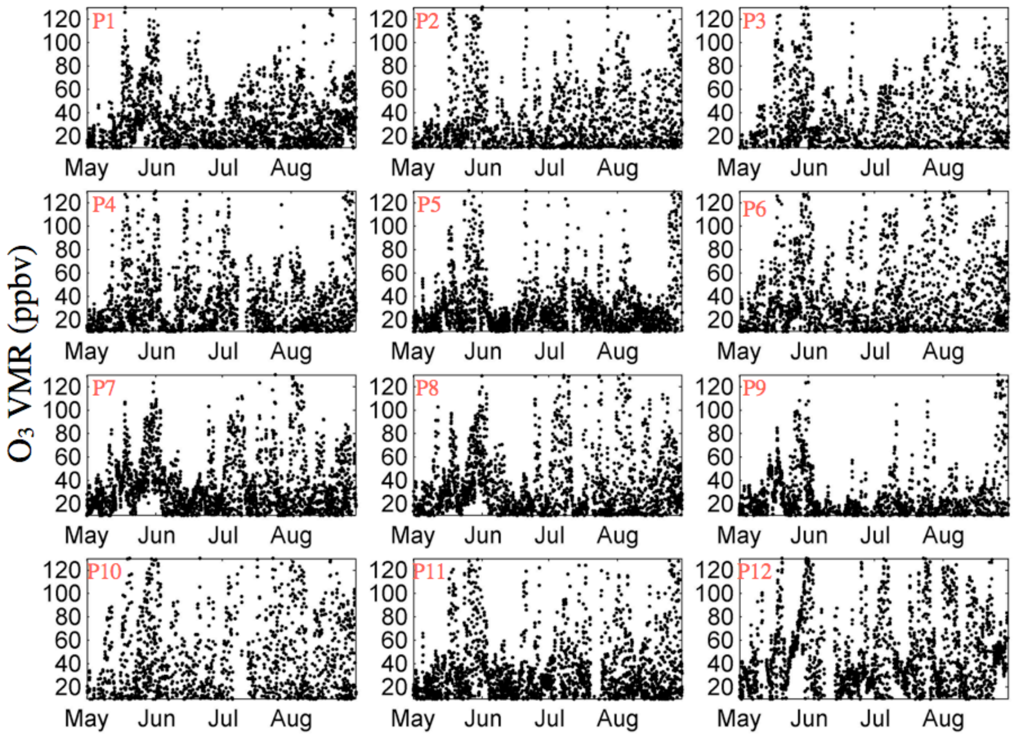

Fig S3. Hourly observations of surface O_3 at Pearl River Delta during the EASM of 2011.

The ground observations of the PRD stations (P1 to P12) in Fig. S2 show frequent O_3 peaks and what is noted is that the decrease detected during the EASM is starting June whereas it was couple of weeks later in the NCP region. In fact, the EASM is latitude dependent and this region is lower in latitude and thus affected by the EASM earlier than the NCP region, a result also detected for the O_3 column in Fig. 2. The O_3 VMR increase afterwards in July and August and are comparable to the May values due to the decrease in monsoon strength over this region (also seen in Figure 2).

References

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