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Supplement of

Effect of vehicular traffic, remote sources and new particle formation on the activation properties of cloud condensation nuclei in the megacity of São Paulo, Brazil

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Supplementary Information (SI)

Table S1. Detailed information related to theFig. 1.In this table are described the instrumental and local conditions, as well as regions and values.

Country	Sites	year / period	id	PCN ± SD (x 10^3 cm^{-3})	CCN (SS%) (x 10^3 cm^{-3})	Instrument	vehicle (million)	inhabitant (million)	Populational density (Km^{-2})	Sampling site	Reference
Brazil	São Paulo	2014 (Aug/Sep) 14 days	1.1 CCN and PCN mean 1.2 Diurnal mean 1.3 Nocturnal mean	11.6 ± 3.1 16.4 ± 7.9 6.9 ± 3.4	2(0.2), 2.6(0.4), 3.2(0.6), 3.6(0.8), 4(1.0) 1.7(0.2), 2.5(0.4), 3.2(0.6), 3.6(0.8), 4(1.0) 1.7(0.2), 2.7(0.4), 3.3(0.6), 3.7(0.8), 4(1.0)	DMT CCN-100 (SS 0.2 - 1.0%) DMPS (10- 450 nm)	7	20	2552.0	Rooftop of building (30m above ground) urban area	This study
	São Paulo	2012 (Oct - 15 days)	2 CCN and PCN mean	12.8 ± 5.4	1.1(0.2), 2.2(0.5), 2.8(0.7), 3.2(0.9), 3.6(1.1)	DMT CCN-100 (SS 0.2 - 1.0%) DMPS (10- 450 nm)	7	20	-	Rooftop of building (40m above ground) urban area	Almeida et al., 2014
	São Paulo	2010 Oct - 2011 Jan (79 days)	3 PCN mean	23.5	-	DMPS (6 - 800 nm)	7	20	-	Rooftop of building near urban area	Backman et al., 2012
China	Shangai	2010 - 2011 (1 year)	4 CCN and PCN continental air mean	10	4.5(0.2), 5.7(0.4), 7(0.6), 7.8(0.8), 8.2(1.0)	DMT CCN-100 (SS 0.07 - 2%) DMPS (20-800 nm)	2.2	24	3800	Rooftop of building (30m above ground) residential urban area	Leng et al., 2013
	Shangai	2010 (Apr/Jun)	5 PCN mean	12.9	-	DMPS (15-600 nm)	2.2	24	-	Roof six-floor building, urban residential and business areas	Peng et al., 2014
	Beijing	2006 (Aug/Sep)	6.1 CCN and PCN mean 6.2 Fresh city pollution 6.3 Aged regional pollution	16.5±9.0 22.5 ± 7.3 11.9 ± 2.8	5.7(0.26), 7.7(0.46), 8.7(0.66), 9.5(0.86) 2.9(0.26), 5.0(0.46), 6.8(0.66), 8.3(0.86) 7.3(0.26), 8.8(0.46), 9.2(0.66), 9.9(0.86)	DMT CCN-100 (SS 0.07 - 0.86%) DMPS (3-800 nm)	2.6	18.6	1300	Rooftop third-floor building in a suburban area	Gunther et al., 2011
Mexico	Mexico City	2006 (Mar)	7 PCN mean	21	-	DMPS (15 - 494 nm)	4	20	6000	Residential and light industrial area	Kalafut-Pettibone et al., 2011
Spain	Madrid	2007-2008	8 PCN mean	9.9	-	DMPS (15 - 1000 nm)	4	6	5325	Park inside metropolitan region	Gómez-Moreno et al., 2011
UK	London	2009	9 PCN mean	12.1 ± 5.8	-	DMPS (7 - 1000 nm)	2.6	13	5223	North Kensington, surrounded by a mainly residential area.	Reche et al., 2011

Reference		Site	Environment	0.20%	0.40%	0.60%	0.80%	1.0%
This study	**Total mean**	Sao Paulo	Urban	136±43	108±36	91±35	81±34	74±34
	Diurnal			155±46	127±32	110±29	99±29	92±29
	Nocturnal			115±25	87±28	71±28	61±28	54±28
Leng et al.(2013)		Shangai	Urban/Coast	-	-	-	41[a] - 68[b]	-
Burkart et al.(2011)		Vienna	Urban	-	-	69 - 368[c]	-	-
Sihto et al.(2011)		Finland	Forest	-	58 - 99	-	-	-
Quinn et al.(2008)		Gulf of Mexico	Coast	-	70 - 90[d]	-	-	-
			Urban	-	> 90[e]	-	-	-
		Atlantic Ocean	Over Ocean	-	< 80	-	-	-
Furutani et al.(2008)		California	Urban/Coast	-		70 - 110[d]		
				-		~110[f]		
		Pacific Ocean	Over Ocean	-		50 - 60		

a - Marine air
b - Continental air
c - min-max at SS = 0.5%
d - Anthropogenic emissions or polluted air masses
e - Urban and industrial sources
f - Fresh Ship Exhaust

Table S2. Comparison between D_{act}calculated in this study and those reported in previous studies. These activation diameters were calculated using thesame principle.

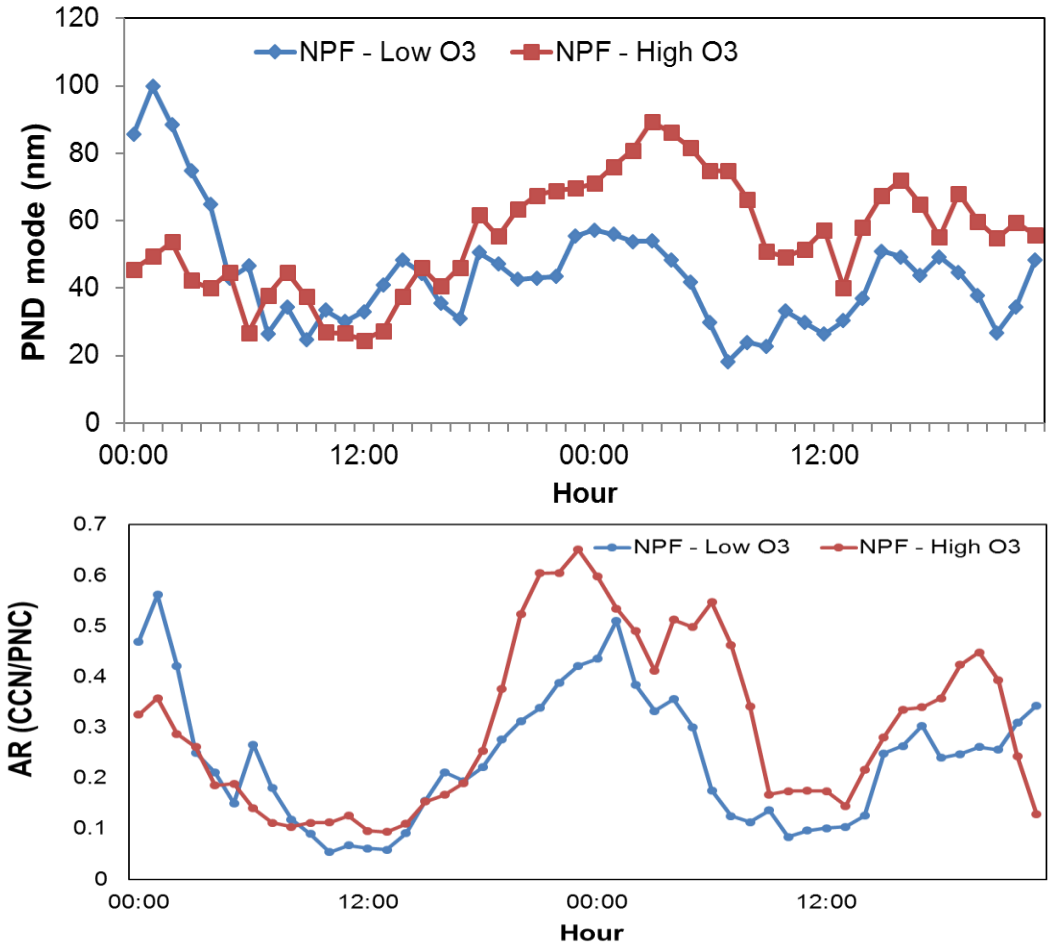

Figure S1. Hourlymode of particle diameter (PND mode) and AR (SS 0.4%) for NPF events with low and high O_3 concentrations. In order to evaluate particle increase were plotted the day after NPF event. The days after NPF-low O_3 showed low O_3 concentrations also, which can explain the lower diameter and AR for these days compared with days after NPF-high O_3.

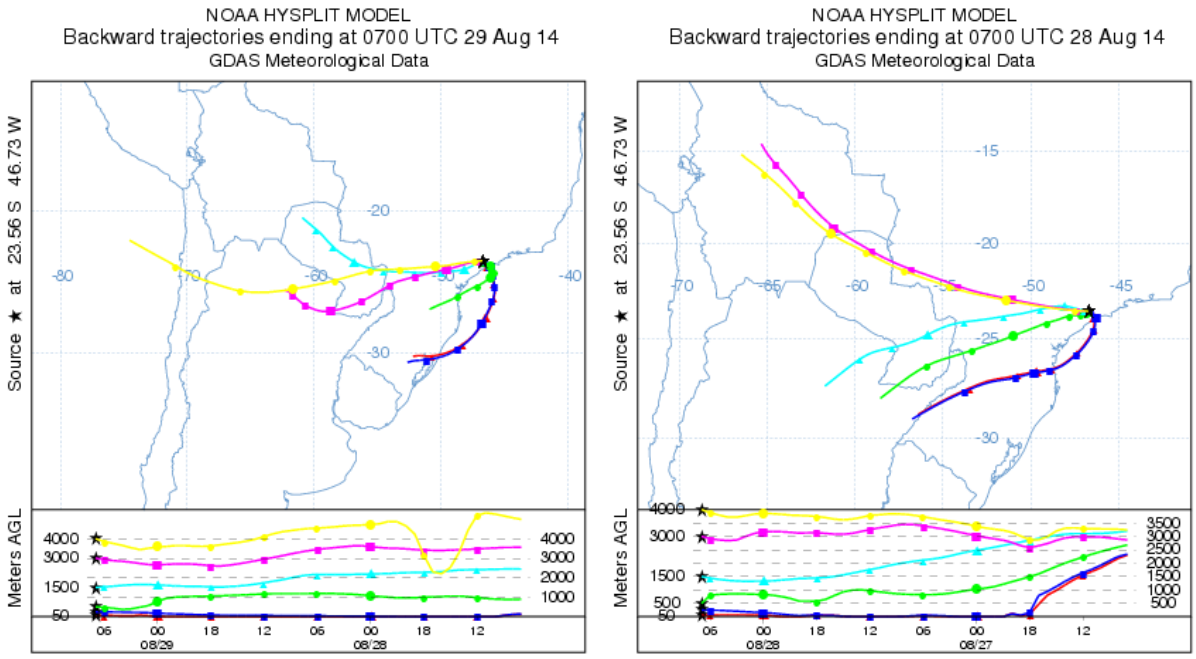

Figure S2. Hysplit backward trajectories models for days 7 and 8. For these period was observed Cl and Pb higher concentrations which were associated with air masses from ocean, as discusses in Section 3.3.

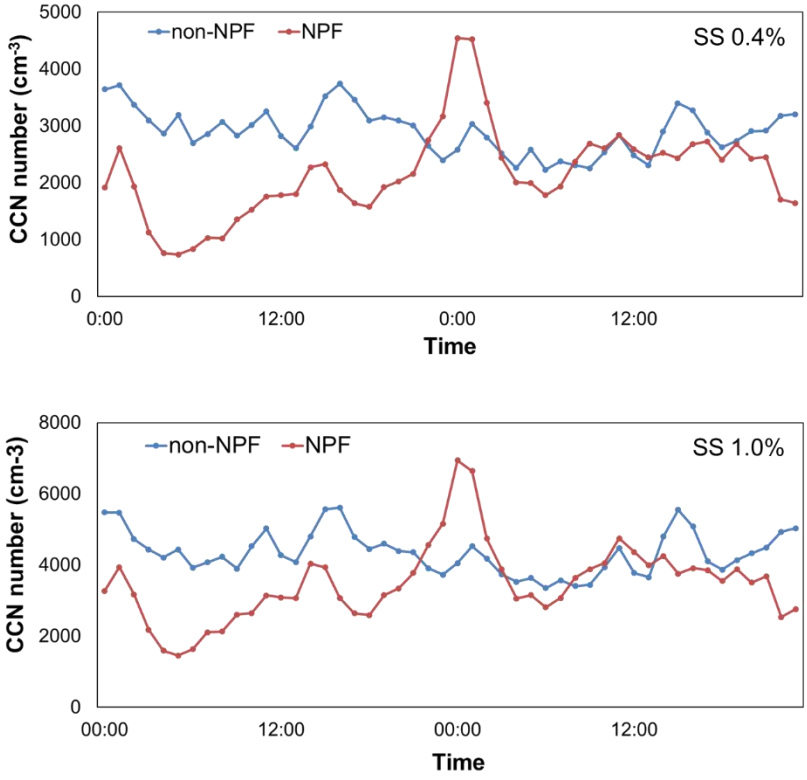

Figure S3. CCN number concentrations during NPF and non-NPF days. CCN averages were calculated for 48h period, being the first day select as NPF or non-NPF, while the second daywas not considerate in this classification. During NPF days the CCN number is lower than non-NPF days in agreement with previous discussion about AR showed in Fig. 8. In this figure can be seen clearly the enhancement of CCN number for NPF days in comparison with non-NPF.

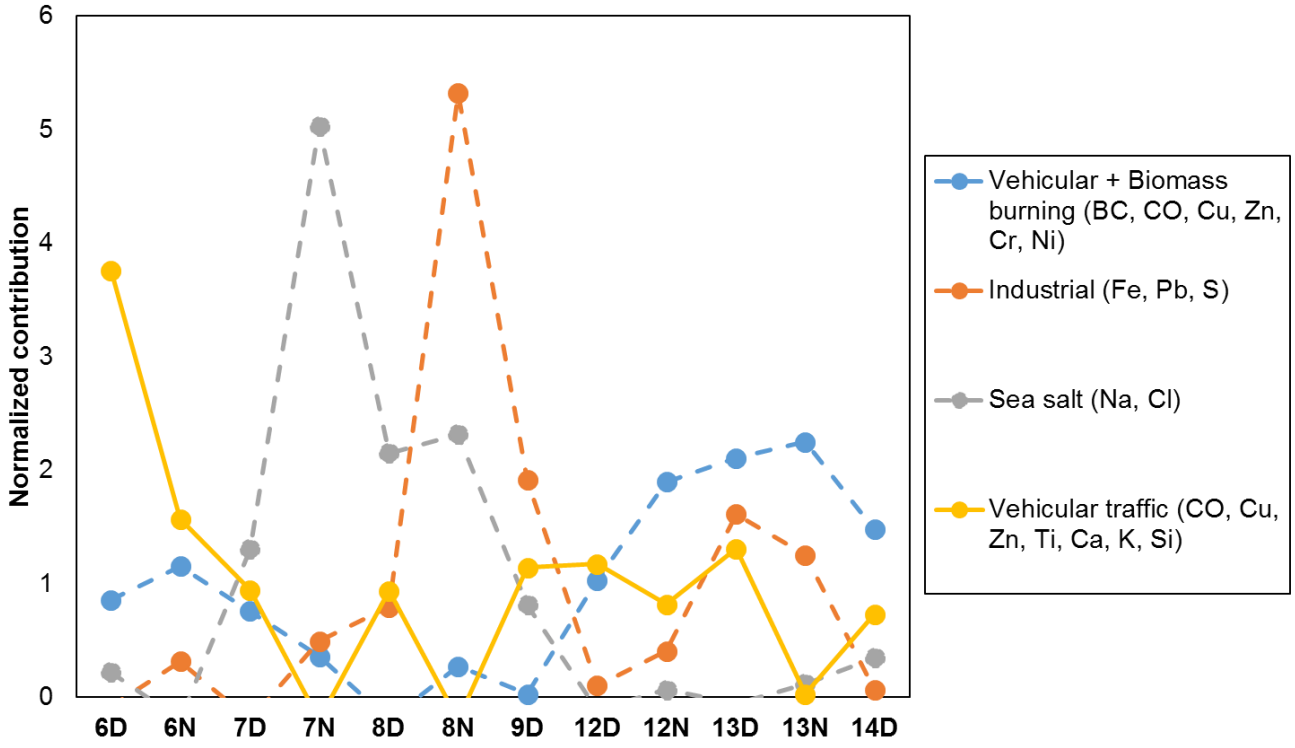

Figure S4. Source apportionment analysis performed by positive matrix factorization (PMF) model, using elemental, carbon monoxide and BC concentrations. Vehicular traffic showed major contributions in most days during daytime mainly, whereas vehicular + biomass burning had main contributions on days 6, 12 and 13. Sea salt and industrial apportionment was most pronounced during days 7 and 8.

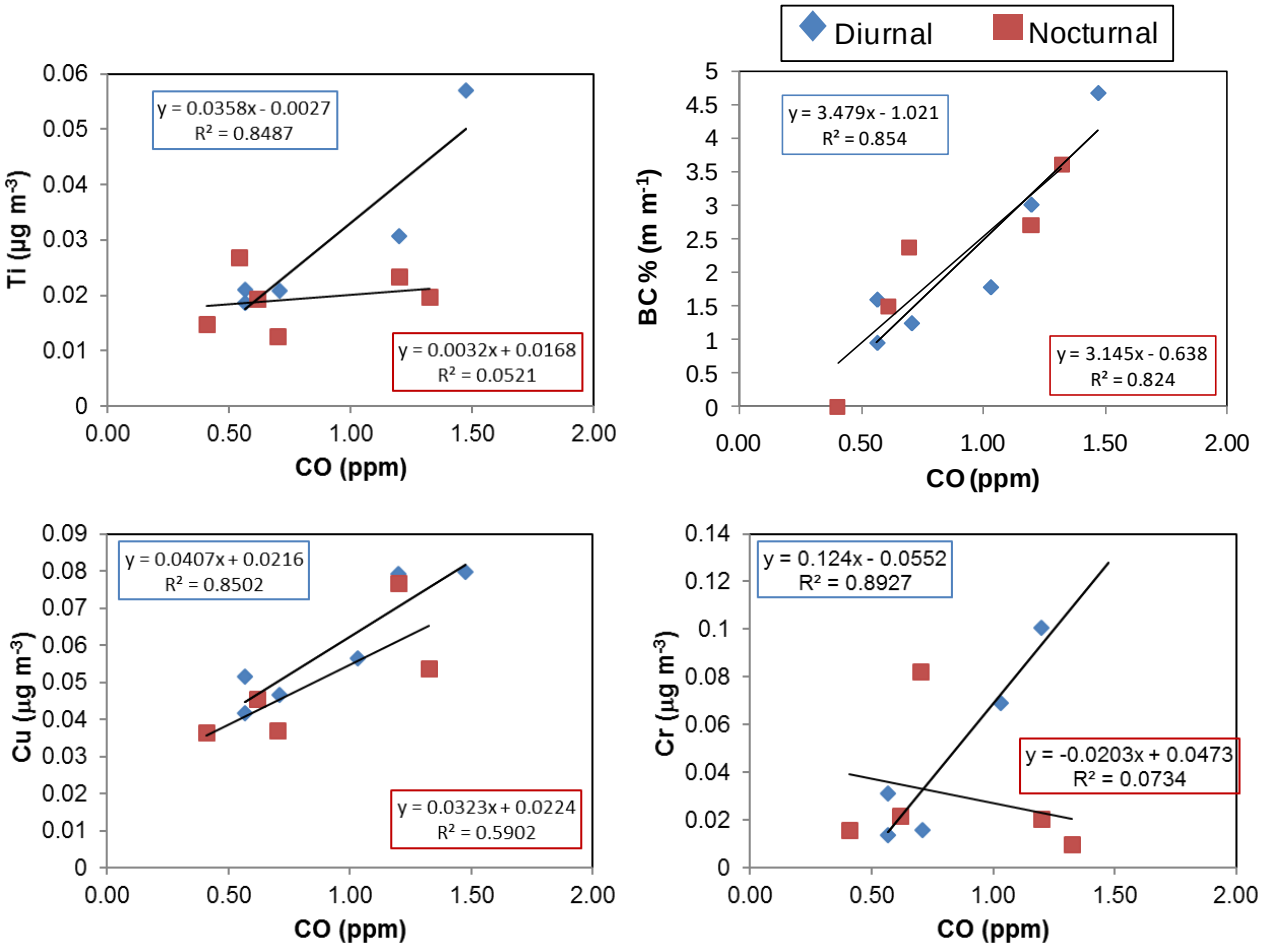

Figure S5. Elemental and BC concentrations versus carbon monoxide (CO). The strong correlation between vehicular markers species and CO during daytime confirm the major apportionment of this source to aerosol for all days. The strong correlation between BC, Cu and CO during nighttime can be related vehicular + biomass burning events.

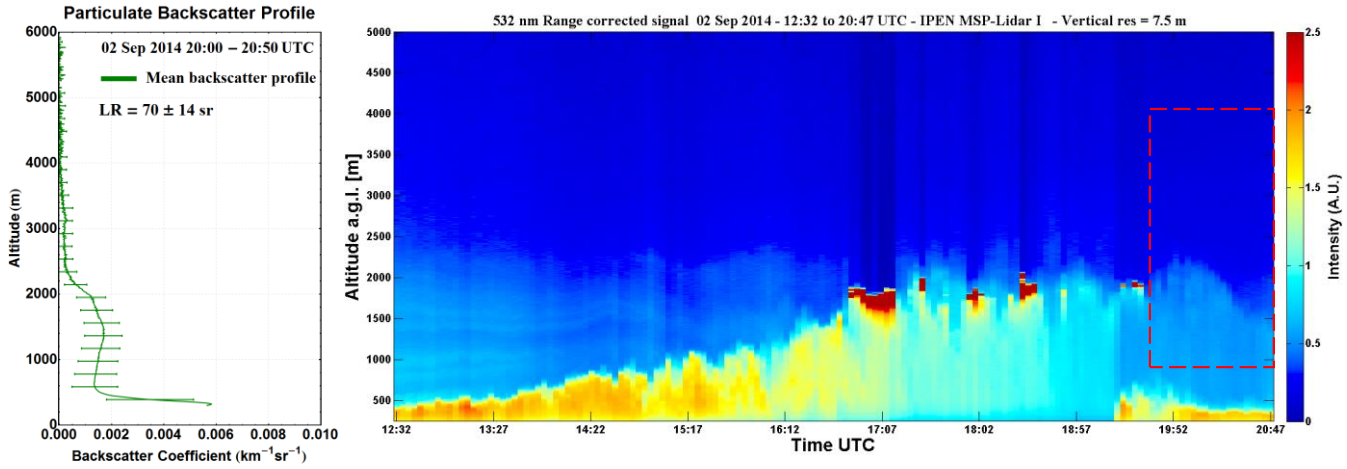

Figure S6. The particulate backscatter profile and lidar analyses for day13, when the prevailing wind was from the north or north-east, where most biomass burning events occur.The biomass burning plumes were detected by lidar and Geostationary Operational Environmental Satellite.