Supplementary Material

Exposure and Respiratory Tract Deposition Dose of Equivalent Black Carbon in High Altitudes

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Received: 14 May 2020; Accepted: 2 June 2020; Published: date

Table S1. Review of related literature. Despite the numerous studies on the exposure and/or respiratory deposition dose (RDD) of pollutants in different transport microenvironment, only few included black carbon (BC) particles as measured pollutants. The discussion in the main manuscript was focused only on the studies (text in bold) where both exposure and RDD of eBC were investigated. Please note that abbreviation eBC (equivalent black carbon) is used in case black carbon mass concentration was measured using micro-aethalometer.

Year Published	Location	Pollutants measured	Mode of Transport	
			Active	Passive
1998	London, UK [51]	Black Smoke	Cycling	Car, bus, train
1998	Berlin, Germany [52]	PAH [a], EC [b]	-	Car, subway
2001	London, UK [53]	$PM_{2.5}$	Cycling	Car, bus, subway
2005	London, UK [54]	$PM_{2.5}$, PNC [c], CO	Cycling and walking	Taxi, car, bus
2007	Mexico, Mexico [55]	$PM_{2.5}$, benzene, CO	-	Minibuses, buses, subway
2008	Dublin, Ireland [56]	$PM_{2.5}$, VOC [d]	Cycling	Car, bus
2009	London, UK [57]	$PM_{2.5}$, PNC [c], CO	Cycling and walking	Taxi, car, bus
2010	Sydney, Australia [58]	$PM_{2.5}$, PNC [e]	-	Car, bus, train, ferry
2010	Arnhem, The Netherlands [59]	PM_{10}, $PM_{2.5}$, PNC [e], soot	Cycling	Diesel and electric buses; gasoline and diesel cars
2012	Barcelona, Spain [8]	$PM_{2.5}$; CO; eBC	Cycling and walking	Car and bus
2012	Beijing, China [60]	$PM_{2.5}$, CO	Cycling	Taxi, bus
2012	Shanghai, China [61]	PM_1	Cycling and walking	Taxi, bus, subway
2012	Mol, Belgium [10]	eBC	Cycling and walking	Car (driver and passenger), train (light rail and metro), and bus
2013	Jakarta, Indonesia [62]	$PM_{2.5}$, PNC [e], CO	-	Car, public transport (buses, minibuses)
2013	Christchurch, New Zealand [63]	PM_1, PNC [e], CO	Cycling	Car, bus

2014	Thessaloniki, Greece [12]	PM_{10}; $PM_{2.5}$; eBC	Cycling	Bus and car (windows open and closed)
2014	Newcastle, UK and Mumbai, India [64]	PM_{10}, CO	Cycling (Newcastle)	Electric vehicle, bus Car, bus, train (Mumbai)
2015	Fort Collins, USA [65]	$PM_{2.5}$, PNC [f], eBC, CO	Cycling	Car
2015	Shanghai, China [13]	eBC	Walking and cycling	Car, MMT, and bus
2015	Taipei, Taiwan [66]	PM10, PM2.5, TVOCs [d]	Walking	Car, bus, subway
2015	Barcelona, Spain [67]	$PM_{2.5}$ (with chemical composition), PNC [g], eBC, ADSA [h], CO, CO_2	Walking	Bus, subway, tram
2017	Bogota, Colombia [28]	$PM_{2.5}$; N_p; eBC	Walking and cycling	Car, bus, and motorcycle
2017	Sacramento, California [11]	$PM_{2.5}$; eBC; UFP	Cycling	Car, bus, and light rail/train
2017	London, UK [9]	PM_{10}; $PM_{2.5}$; PM_1; UFP; eBC	-	Car, bus, and subway
2018	Londrina, Brazil [26]	eBC	Walking and cycling	Bus
2019	Stockholm, Sweden [29]	eBC	Walking, cycling	Car, Bus
This study	La Paz, Bolivia	eBC	Walking	Microbus and Cable Car

[a] Polycyclic Aromatic Hydrocarbons; [b] Elemental Carbon; [c] Particle size range 20-1000 nm [d] Total Volatile Organic Compounds; [e] Particle size range 10-1000 nm; [f] Particle size range 10-700 nm; [g] Particle size range 10-300 nm; [h] Alveolar Deposited Surface Area.

Table S2. Minute ventilation (MV) for different levels of activity based on energy expenditure (EE) or metabolic equivalent from various references.

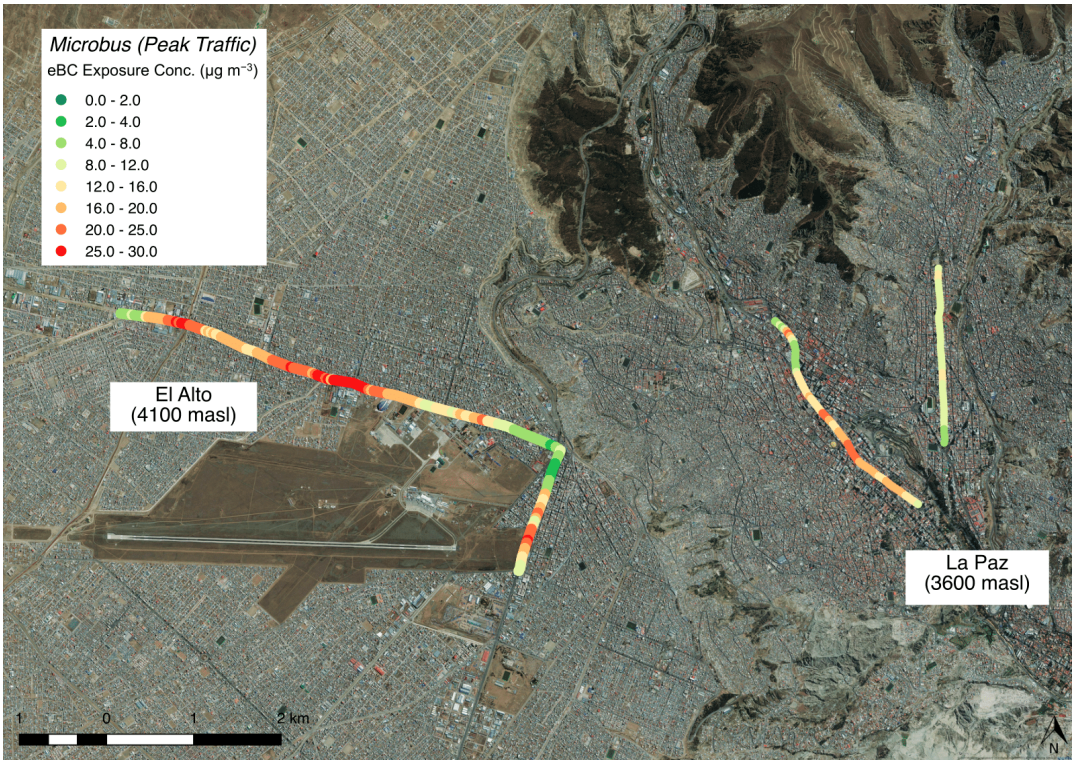
Variable	Female		Male		
	Horiuchi et al. 2019	EPA 2011	Horiuchi et al. 2019	EPA 2011	Milledge 1968
Age	23.9 ± 5.8	21 to <31	22.6 ± 4.1	21 to <31	31.3 ± 7.7
Rest (Sitting)					
EE, Watts	91 ± 13		114 ± 14		
METS		<1.5		<1.5	
MV, $m^3\ min^{-1}$	1.04×10^{-2}	0.419×10^{-2}	1.39×10^{-2}	0.511×10^{-2}	1.885×10^{-2}
Intensity I (Walking)					
EE, Watts	204 ± 24		264 ± 40		
METS		3.0 < METS < 6.0		3.0 < METS < 6.0	
MV, $m^3\ min^{-1}$	1.92×10^{-2}	2.29×10^{-2}	2.33×10^{-2}	2.92×10^{-2}	4.758×10^{-2}
Intensity II (Heavy Running)					
EE, Watts	455 ± 55		559 ± 67		
METS		METS > 6.0		METS > 6.0	
MV, $m^3\ min^{-1}$	5.00×10^{-2}	4.57×10^{-2}	5.58×10^{-2}	5.39×10^{-2}	11.48×10^{-2}

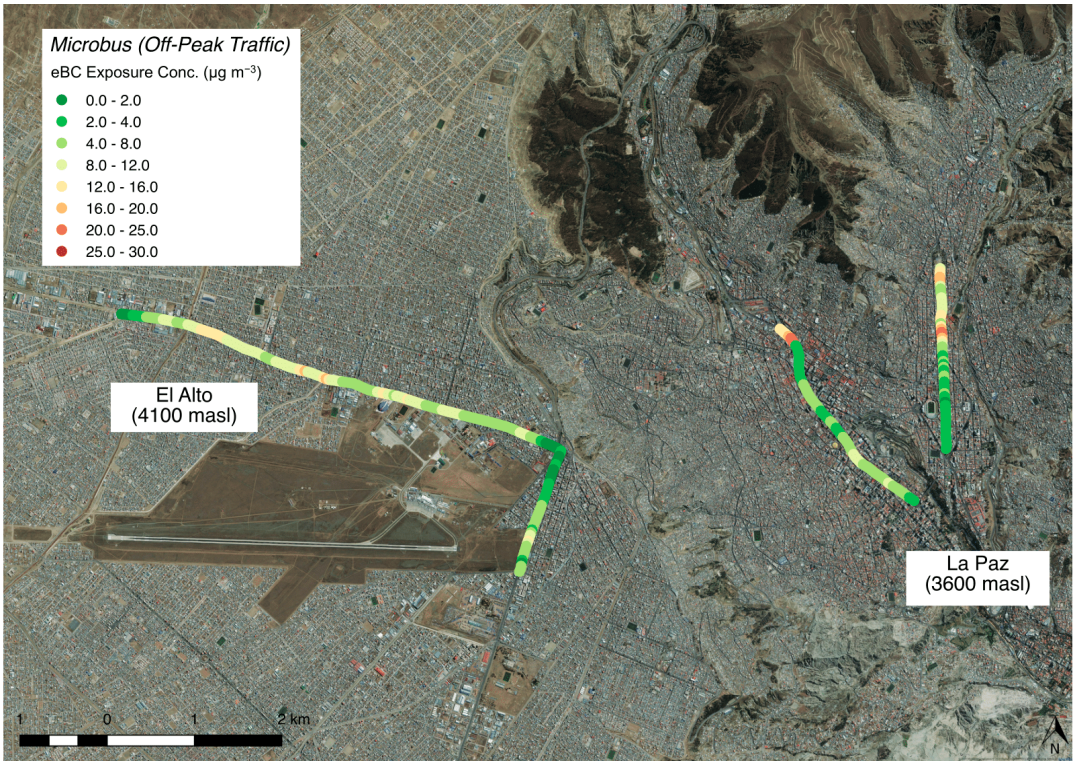
Table S3. Descriptive statistics showing the arithmetic mean (Mn), standard deviation (SD in parenthesis), arithmetic median (Mdn in square bracket) of eBC exposure concentration ($\mu g\ m^{-3}$) at local conditions on each of the routes, mode of transport, and sampling period.

Mode	Sampling period	Street 1	Street 2	Street 3	Street 4	Street 5
Cable Car	AM	4.4 (2.8)	-	-	-	3.4(1.4)
	PM	1.3 (0.9)	-	-	-	1.0(0.9)
	Overall *			2.5 (2.1) [1.9]		
Walk	AM	10.5 (15.7)	9.5(14.8)	12.9(27.1)	-	4.8(7.3)
	PM	3.9 (12.2)	5.3(11.8)	5.6(7.8)	-	2.0(3.5)
	Overall *			7.0 (14.7) [3.3]		
Microbus	AM	8.0 (11.0)	23.1(28.1)	15.2(17)	27.7(50.7)	-
	PM	8.3 (16.2)	12.0(19.6)	5.0(8.5)	10.8(16.9)	-
	Overall *			16.9 (29.9) [8.7]		

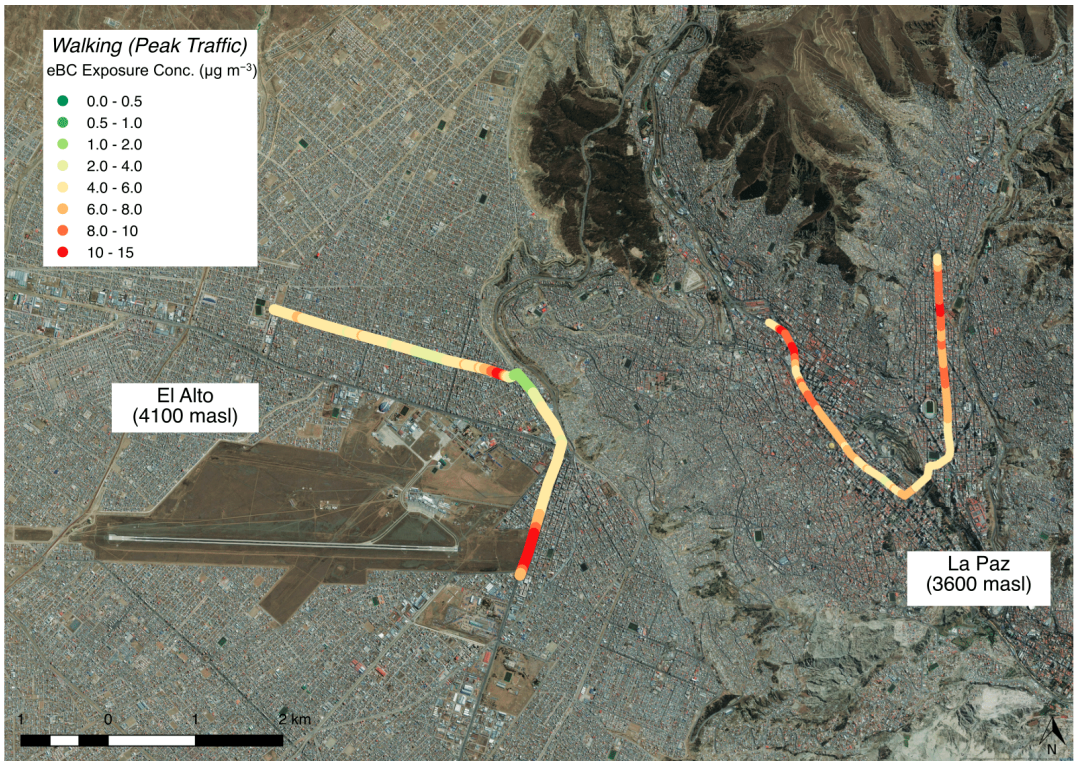
*Statistics over all streets and sampling period (Peak traffic: AM, Off-peak traffic: PM).

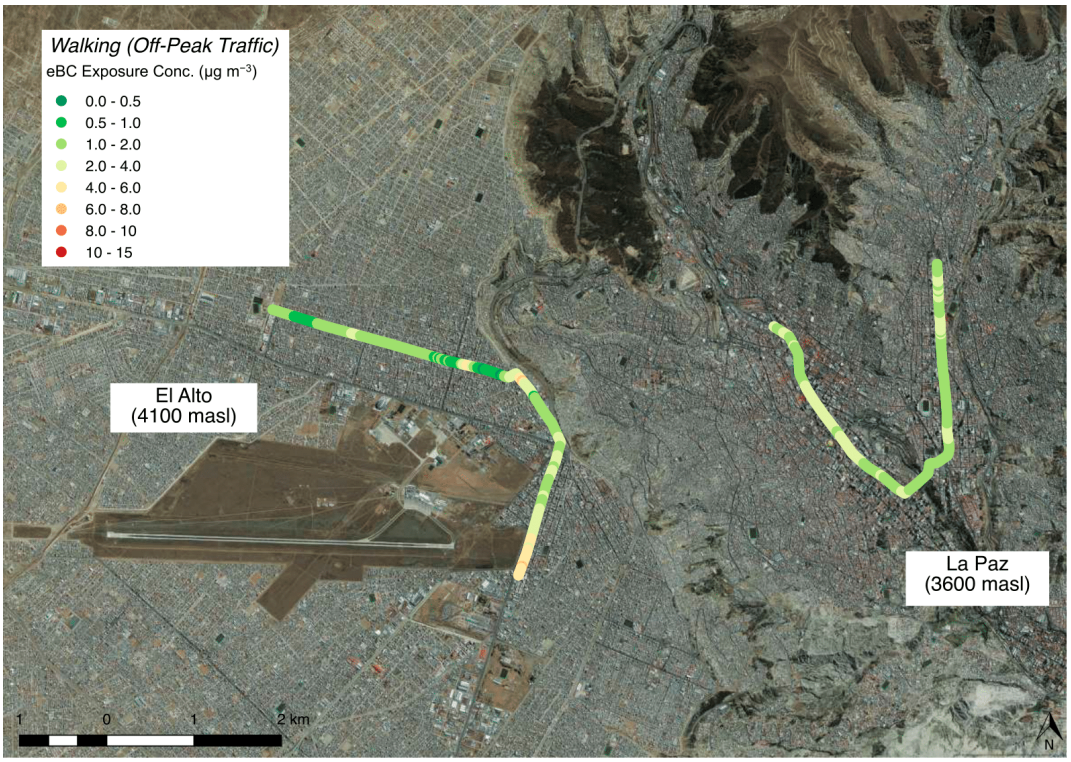
(a)


Microbus (Peak Traffic)
eBC Exposure Conc. (μg m⁻³)
0.0 - 2.0
2.0 - 4.0
4.0 - 8.0
8.0 - 12.0
12.0 - 16.0
16.0 - 20.0
20.0 - 25.0
25.0 - 30.0
El Alto
(4100 masl)
La Paz
(3600 masl)
1 0 1 2 km
N


Microbus (Off-Peak Traffic)
eBC Exposure Conc. (μg m⁻³)
0.0 - 2.0
2.0 - 4.0
4.0 - 8.0
8.0 - 12.0
12.0 - 16.0
16.0 - 20.0
20.0 - 25.0
25.0 - 30.0
El Alto
(4100 masl)
La Paz
(3600 masl)
1 0 1 2 km
N

(b)


Walking (Peak Traffic)
eBC Exposure Conc. (µg m⁻³)
0.0 - 0.5
0.5 - 1.0
1.0 - 2.0
2.0 - 4.0
4.0 - 6.0
6.0 - 8.0
8.0 - 10
10 - 15
El Alto
(4100 masl)
La Paz
(3600 masl)
1 0 1 2 km
N


Walking (Off-Peak Traffic)
eBC Exposure Conc. (µg m⁻³)
0.0 - 0.5
0.5 - 1.0
1.0 - 2.0
2.0 - 4.0
4.0 - 6.0
6.0 - 8.0
8.0 - 10
10 - 15
El Alto
(4100 masl)
La Paz
(3600 masl)
1 0 1 2 km
N

(c)

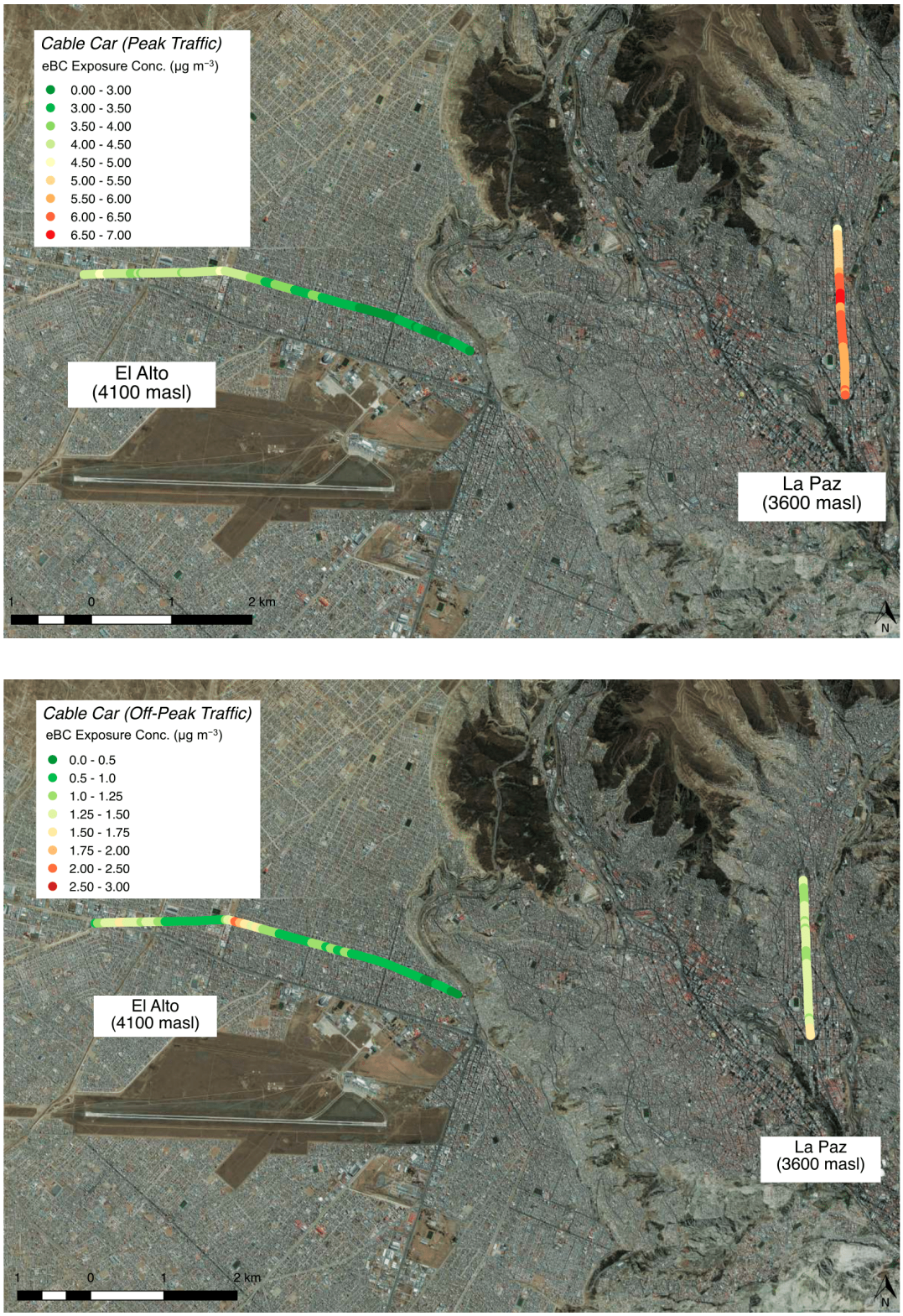


Figure S1. Spatial variability of median eBC exposure concentration (**a**) inside microbus (**b**) while walking (**c**) inside cable car along measurement routes during peak (**top**) and off-peak (**bottom**) traffic hours.

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