Centro Mario Molina

Investigación & desarrollo

Experiences in BC monitoring in Chile

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28 November 2018

Most of the BC measurements are made in Metropolitan Region of Chile

More than 7 million people (40% of the Chilean population), lives in the Santiago Metropolitan Region (RM).

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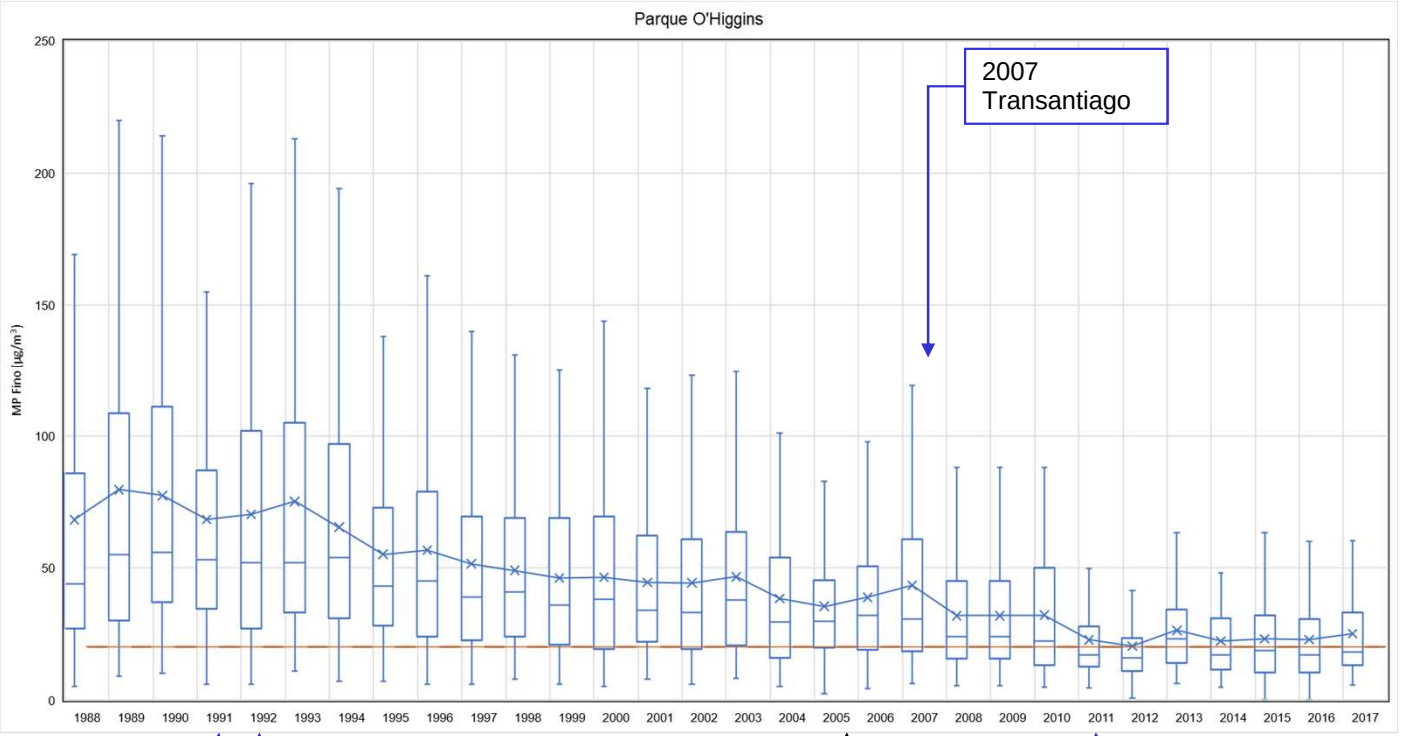

2007
Transantiago

1991
Take out of old buses

1992
Catalitc converter+
Industry regulation+
New public transportation (“yellow buses”)

1994
Diesel desulfuration (5000 ppm)

2005
Cut off natural gas supply from Argentina

2011
Diesel desulfuration (15 ppm)

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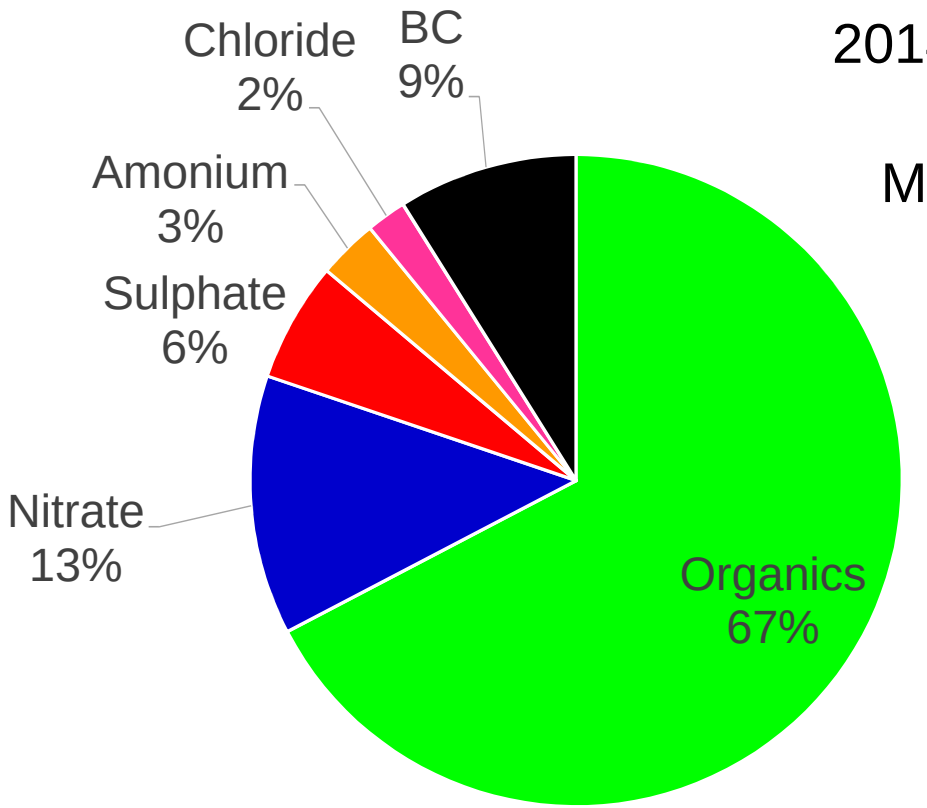
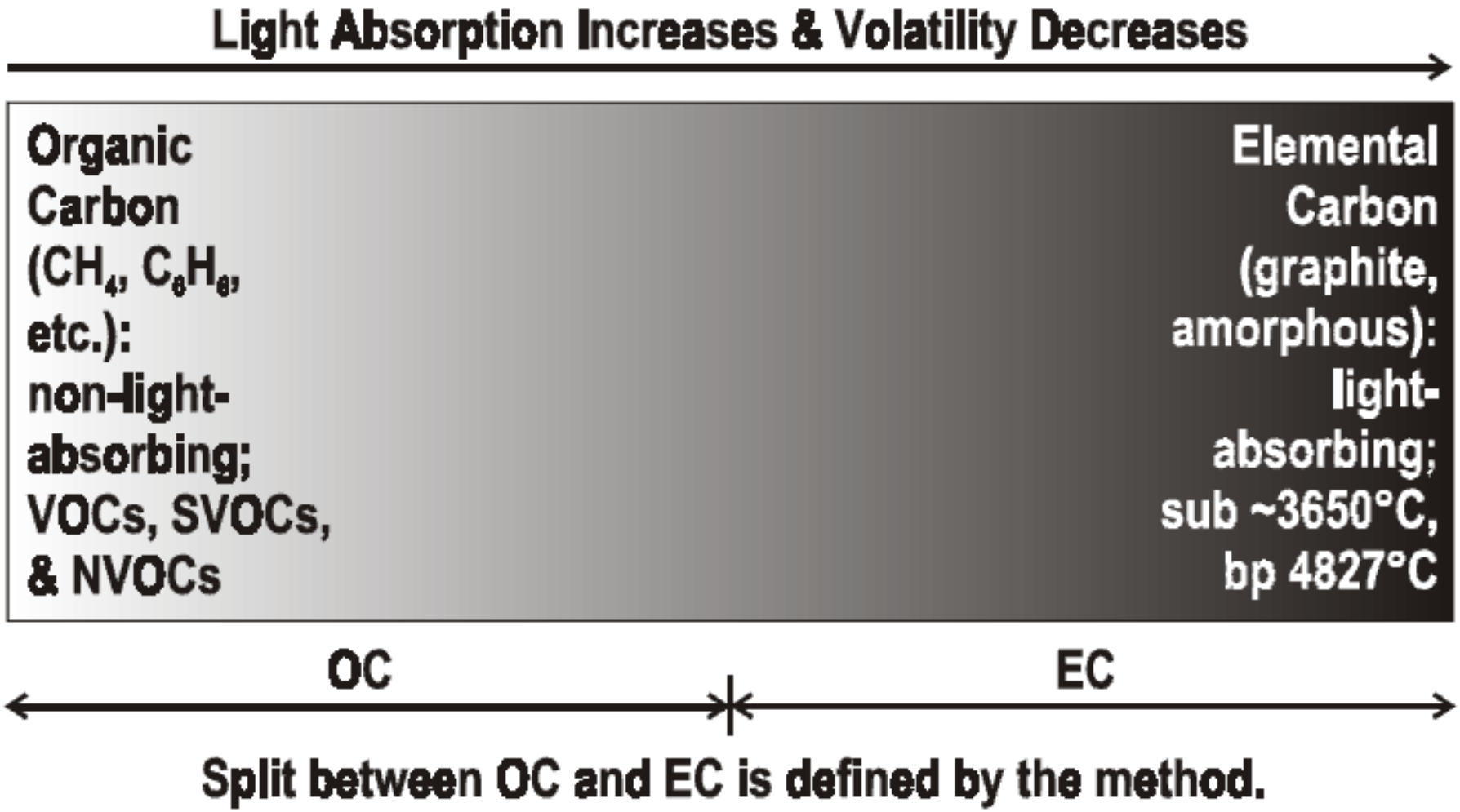
PM2,5
2014

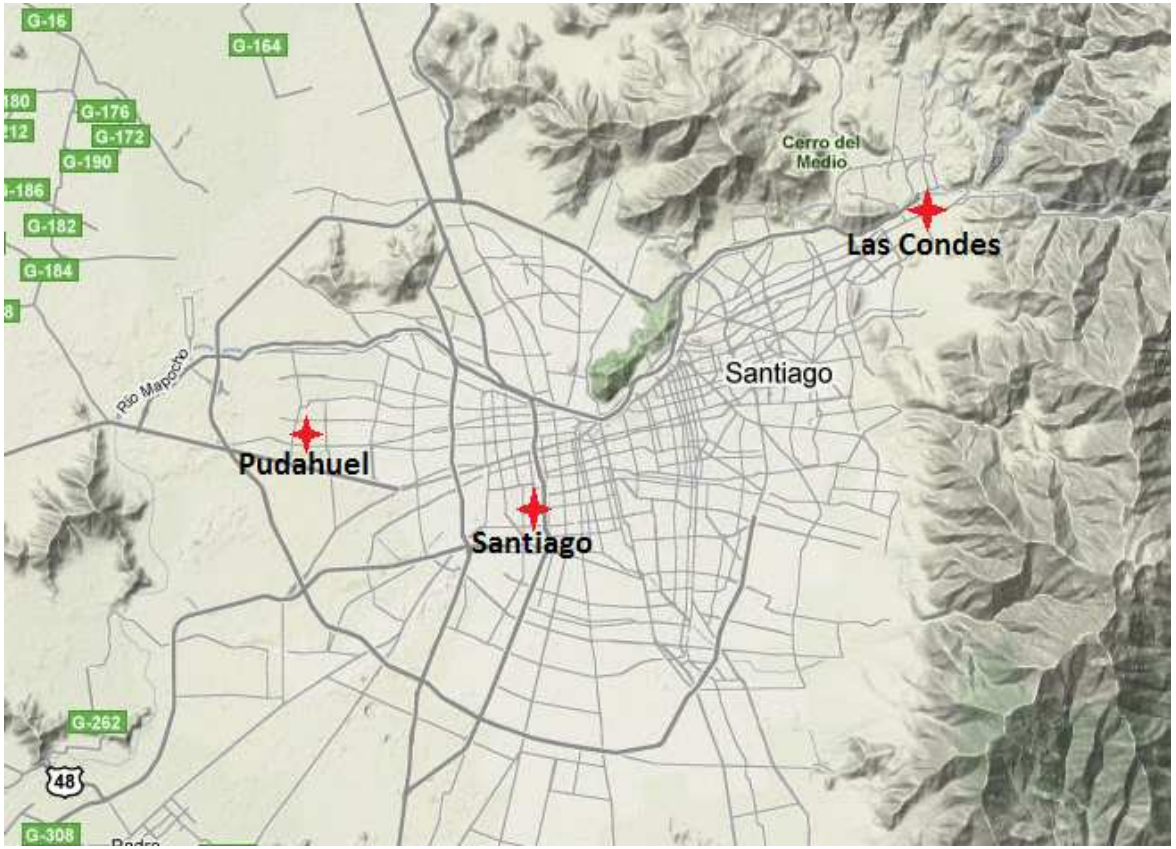


Mass = 70 µg/m^3



Fuente: Thermal-Optical-Transmittance Analysis for Organic, Elemental, Carbonate, Total Carbon, OCX2, in PM2,5 by the EPA/NIOSH Method. Max R. Peterson and Melville H. Richards.

R&P5400



One of the most important database of PM speciation chemical particle composition in the zone

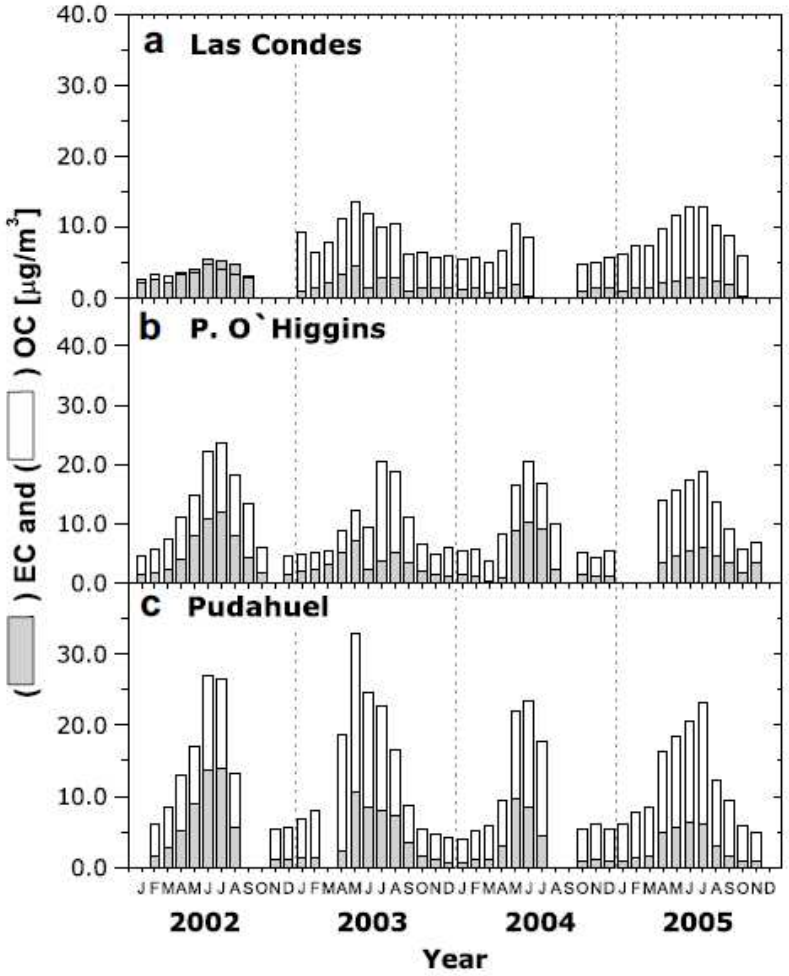


Fig. 2. Annual time series of the organic carbon (OC) and elemental carbon (EC) in $PM_{2.5}$ at (a) Las Condes (M label), (b) Parque O'Higgins (N label) and (c) Pudahuel (O label) stations. The stations labels are according to Fig. 1. Data source: Chilean Ministry of Health, Metropolitan area (SEREMI-RM).

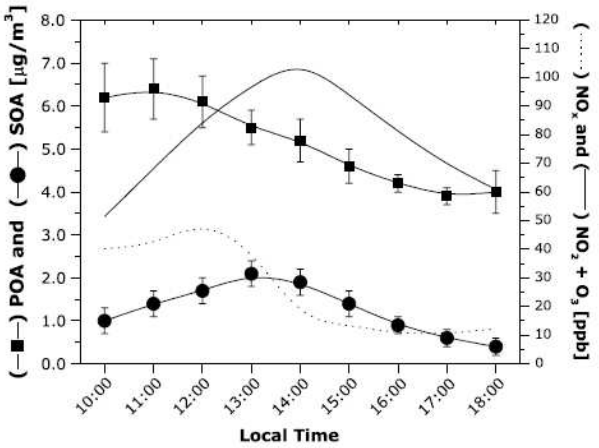


Fig. 6. Primary (POA) and secondary (SOA) organic aerosols in $PM_{2.5}$ and nitrogen oxides (NO_x) and Oxidants ($NO_2 + O_3$) concentration at Las Condes station (M label in Fig. 1) in February 2004.

Seguel, R., Morales, R. G., & Leiva, M. A. (2009). Estimations of primary and secondary organic carbon formation in PM2.5 aerosols of Santiago City, Chile. Atmospheric Environment 43 , 2125–2131

$$OC = POA + SOA$$

$$POA = \left(\frac{OC}{EC} \right)_p * EC$$

✓OC y EC concentration showed a significant seasonal variation.

✓OC y EC species represent a significant component in $PM_{2,5}$, reaching from 19% to 26% in mass. OC is the dominant component (80 % of TC)

✓The aplication of EC traced method (Turpin & Huntzicker, 1991) showed a significant impact in $PM_{2,5}$ mass during summer time, reaching up to 20% of total organic aerosol matter.

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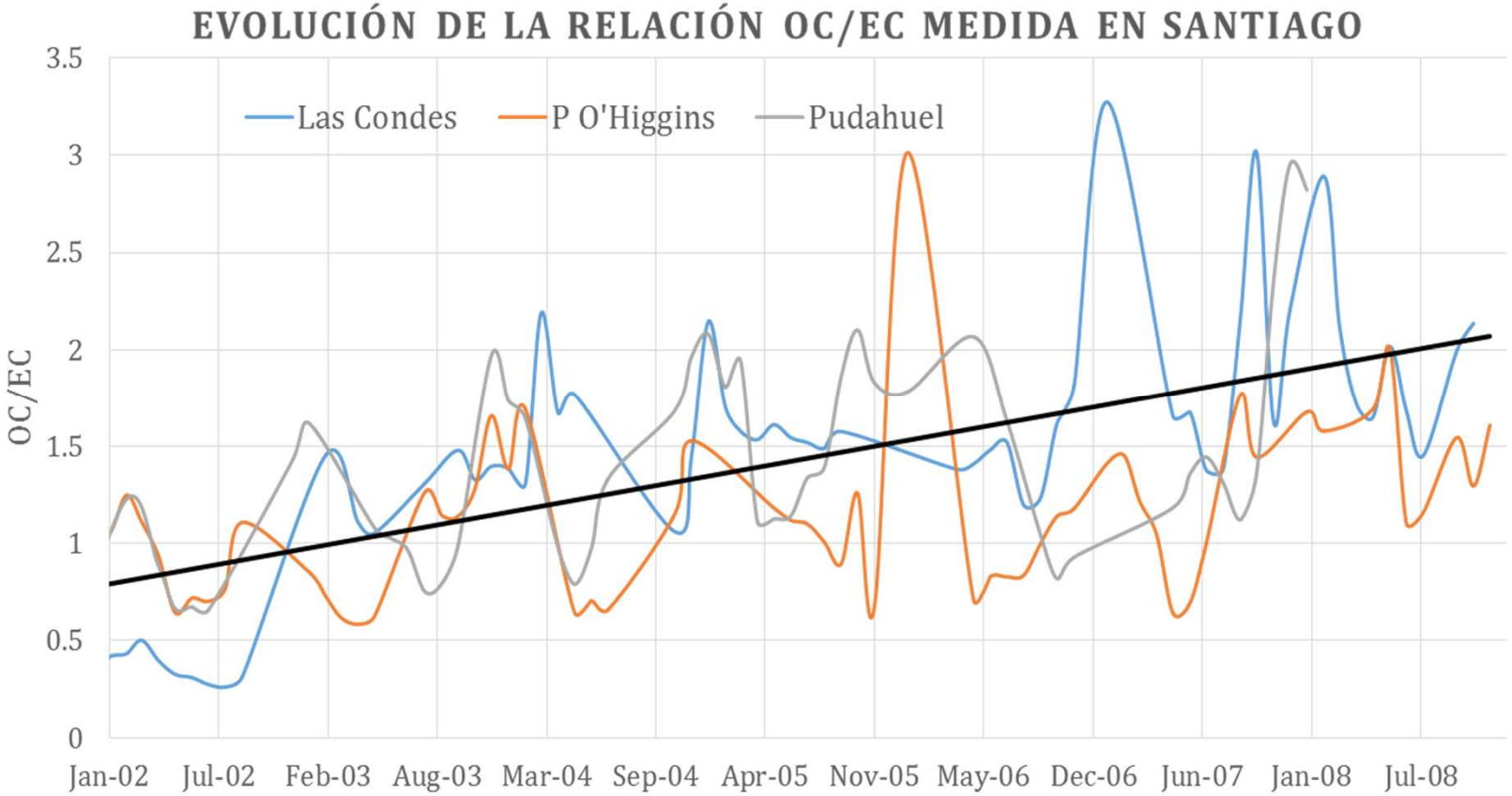


Increase of OC/EC ratio is due to a decreased trend of EC concentration.

Results of better fuel combustion efficiency

R&P5400

Aethalometer

SUNSET

Intercomparison Results

Comparison	Intercept	Slope	R^2
$OC_{Sunset}/OC_{R\&P5400}$	0,029	0,924	0,935
$EC_{Sunset}/EC_{R\&P5400}$	0,152	2,587	0,874
$BC_{Aethalometer}/EC_{Sunset}$	-0,200	1,664	0,981

Intercomparison Results

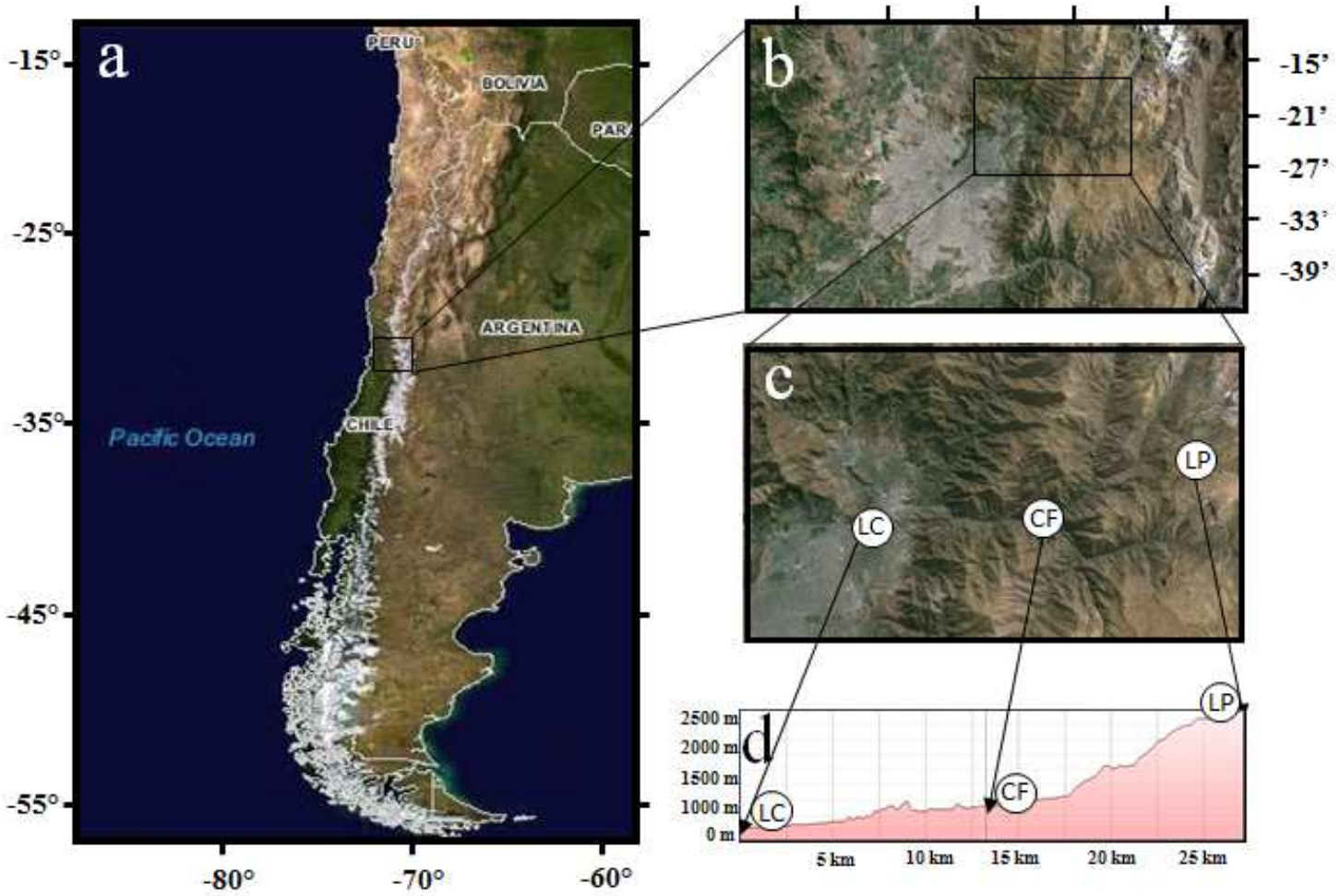
Good intercomparison of OC results

$EC_{R\&P5400}$ concentration are subestimated due low efficiency particle collection below 0.18 μm (Venkatachari, et al., 2006).

$BC_{Aethalometer}$ concentration are subestimated due to absorption coefficient need to be recalibrated using filters methodology.

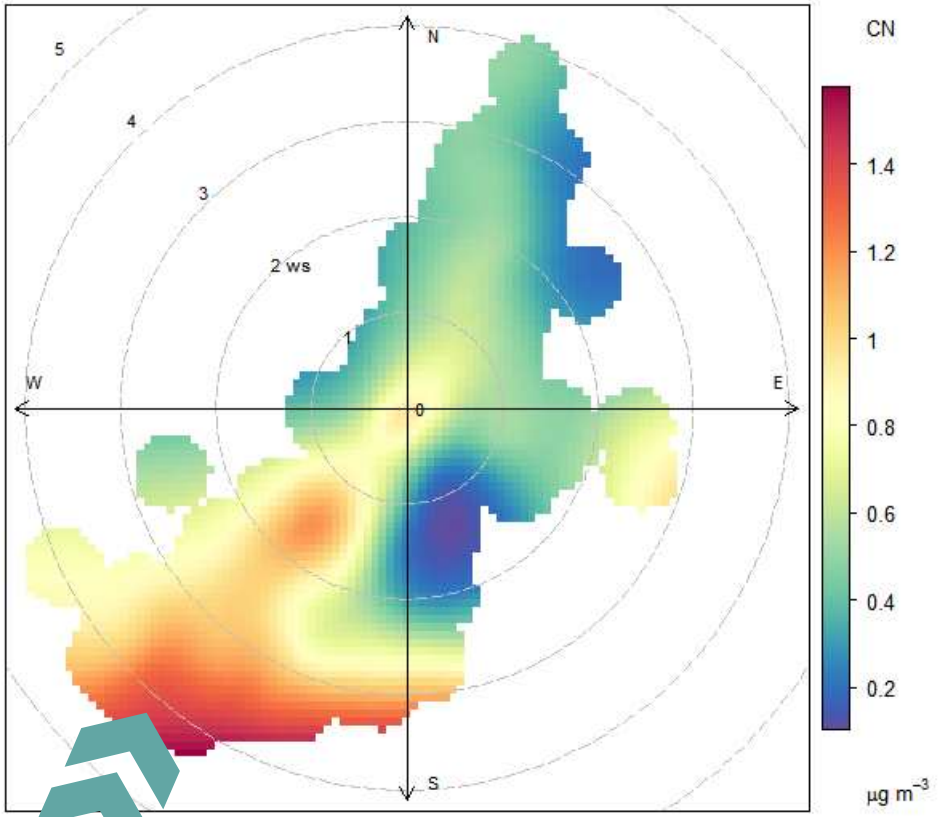
Very reach database used to see the results of public politics.

BC impact in glaciers



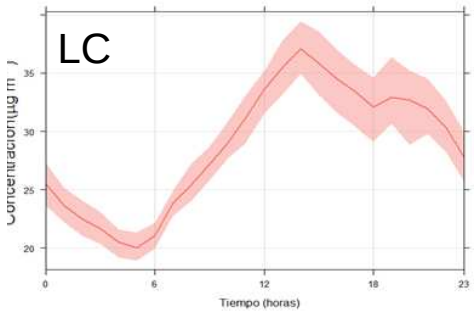
BC impact in glaciers

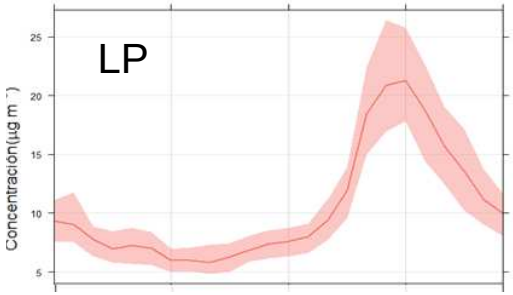
Diciembre-Febrero-Marzo

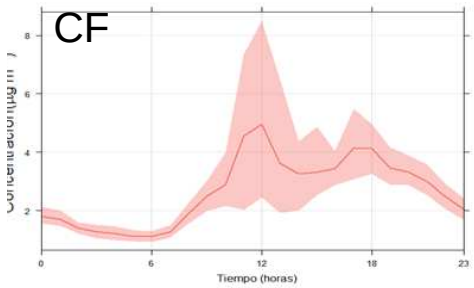


Emission comming form the city

Concentraciones diurnas







Main observation

There is a clear impact of the city BC emissions sources in the Andes glaciers.

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