cca Centro de Ciencias Ambientales
FACULTAD DE CIENCIAS
UNIVERSIDAD DE CHILE

A CONSIDERAR

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Seminario: Una mirada actual de los Planes de Prevención y Descontaminación

Panel 2
Sobre análisis crítico desde la ciencia de las medidas previstas de los PPDAs

Viernes 10 de Noviembre de 2017

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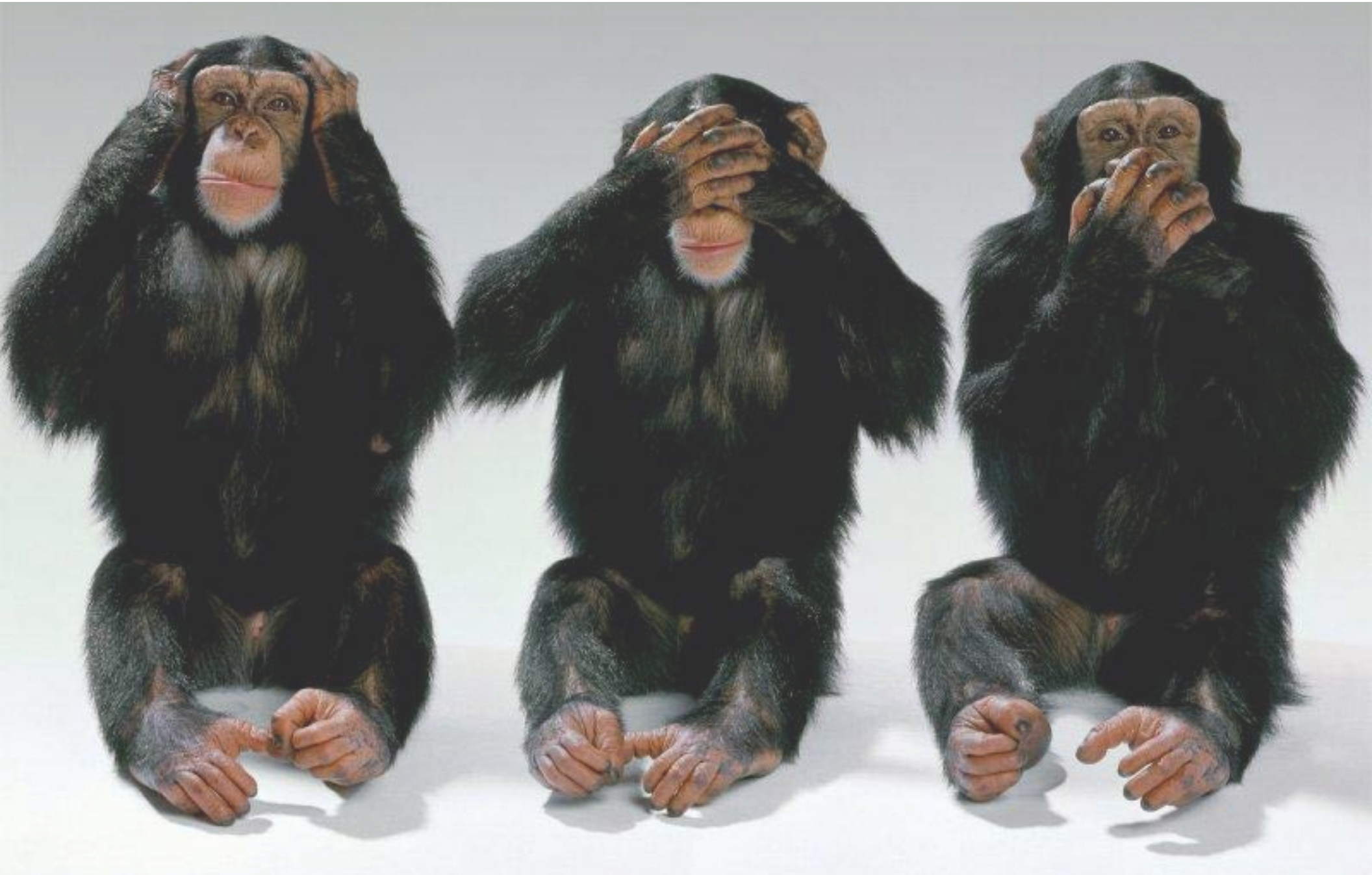

Ni oir, ver y hablar

Medición con *equipos atenuadores beta*

Correspondence

Accuracy and reliability of Chile's National Air Quality Information System for measuring particulate matter: Beta attenuation monitoring issue

Richard Toro A., Claudia Campos, Carolina Molina, Raul G.E. Morales S., Manuel A. Leiva-Guzmán *

Center for Environmental Sciences and Chemistry Department, Faculty of Sciences, University of Chile, Las Palmeras 3425, Ñuñoa, Santiago de Chile, Chile

ARTICLE INFO

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Received 28 January 2015
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Keywords:
Particulate matter
Chilean air quality system
Quality control
Beta attenuation monitoring

ABSTRACT

A critical analysis of Chile's National Air Quality Information System (NAQIS) is presented, focusing on particulate matter (PM) measurement. This paper examines the complexity, availability and reliability of monitoring station information, the implementation of control systems, the quality assurance protocols of the monitoring station data and the reliability of the measurement systems in areas highly polluted by particulate matter. From information available on the NAQIS website, it is possible to confirm that the $PM_{2.5}$ (PM_{10}) data available on the site correspond to 30.8% (69.2%) of the total information available from the monitoring stations. There is a lack of information regarding the measurement systems used to quantify air pollutants, most of the available data registers contain gaps, almost all of the information is categorized as "preliminary information" and neither standard operating procedures (operational and validation) nor assurance audits or quality control of the measurements are reported. In contrast, events that cause saturation of the monitoring detectors located in northern and southern Chile have been observed using beta attenuation monitoring. In these cases, it can only be concluded that the PM content is equal to or greater than the saturation concentration registered by the monitors and that the air quality indexes obtained from these measurements are underestimated. This occurrence has been observed in 12 (20) public and private stations where $PM_{2.5}$ (PM_{10}) is measured. The shortcomings of the NAQIS data have important repercussions for the conclusions obtained from the data and for how the data are used. However, these issues represent opportunities for improving the system to widen its use, incorporate comparison protocols between equipment, install new stations and standardize the control system and quality assurance.

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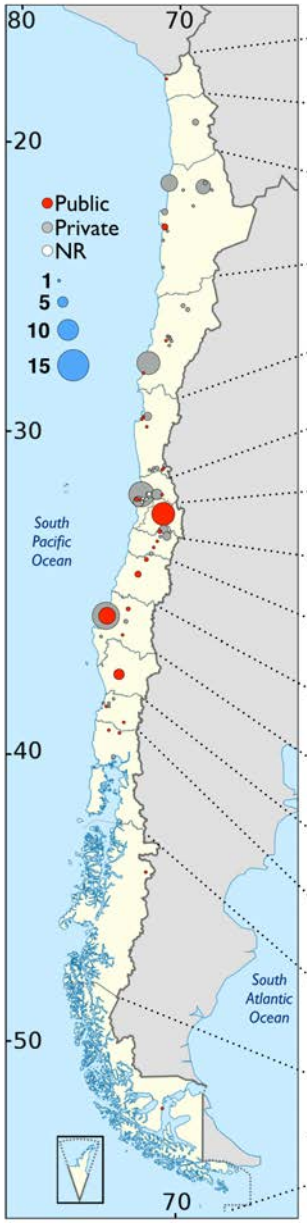
Environment International, 82 (2015) 101. https://doi.org/10.1016/j.envint.2015.02.009

Mediciónes en SINCA



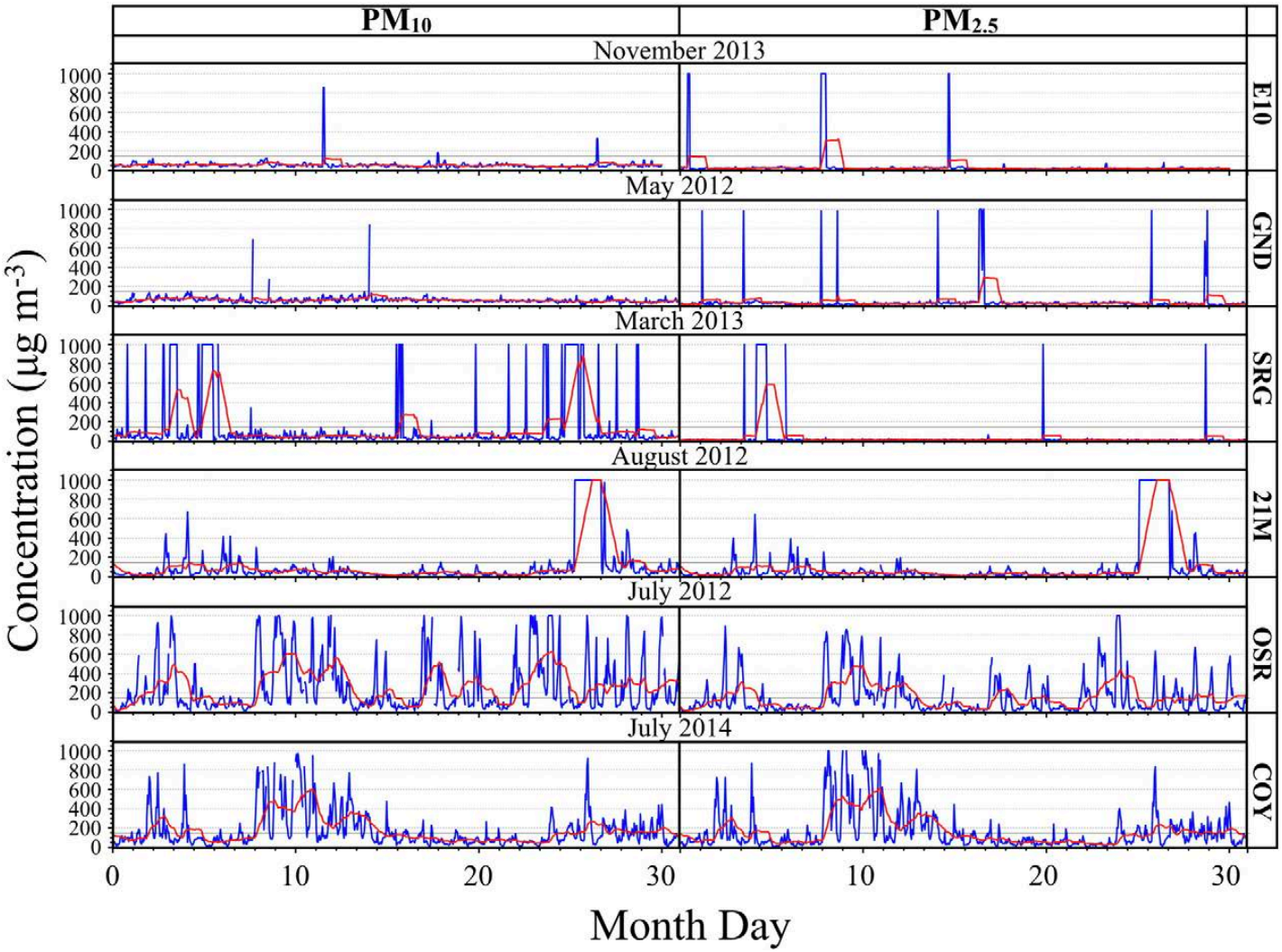
	N°Stations	$PM_{2.5}$	PM_{10}
XV R. de Arica y Parinacota	1 (1)	1 (1)	0 (0)
I R. de Tarapacá	3 (0)	0 (0)	3 (0)
II R. de Antofagasta	29 (3)	10 (1)	26 (3)
III R. de Atacama	26 (2)	3 (2)	15 (1)
IV R. de Coquimbo	18 (5)	2 (2)	15 (3)
V R. de Valparaíso	36 (4)	9 (4)	31 (3)
RM R. Metropolitana de Santiago	11 (11)	11 (11)	11 (11)
VI R. del Lib. Gral. Bernardo O'Higgins	15 (4)	2 (2)	14 (4)
VII R. del Maule	7 (5)	5 (5)	6 (5)
VIII R. del Bio Bio	32 (16)	14 (14)	28 (13)
IX R. de la Araucanía	4 (4)	3 (3)	4 (4)
XIV Región de Los Rios	6 (2)	2 (2)	6 (2)
X Región de Los Lagos	4 (2)	2 (2)	4 (2)
XI R. Aisén del Gral Carlos Ibáñez del C.	2 (2)	2 (2)	2 (2)
XII R. de Magallanes y de la Antártica Ch.	1 (1)	1 (1)	0 (0)
Total	195 (62)	65 (51)	171 (53)

30 %
estaciones
estaciones publicas

Environment International, 82 (2015) 101. https://doi.org/10.1016/j.envint.2015.02.009

Equipos atenuadores beta

Escuela E-10 (E10), **Gendarmería (GND)** y **Sierra Gorda (SRG)** en Región Antofagasta
21 de Mayo (21M) en Región Bio-bío, **Osorno (OSR)** en Los Lagos y
Coyhaique (COY) en Región Aysén del General Carlos Ibáñez del Campo



Environment International, 82 (2015) 101. https://doi.org/10.1016/j.envint.2015.02.009

Calidad y conformidad (compliance)

20%

estaciones

estaciones publicas con ISO 17025 con acreditación

Variabilidad e incertidumbre

Estimating the uncertainty in the atmospheric ammonia concentration in an urban area by Ogawa passive samplers

Manuel A. Leiva G. [a,b,*], Benjamin Gonzales [b], Daniela Vargas [b], Richard Toro [b], Raul G.E. Morales S. [b]

[a] *Department of Land, Air and Water Resources, University of California, Davis, One Shields Avenue, Davis, CA 95616, USA*
[b] *Centro de Ciencias Ambientales and Departamento de Química, Facultad de Ciencias, Universidad de Chile, Casilla 653, Santiago, Chile*

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Atmospheric ammonia concentration
GUM
Ogawa passive sampler
Uncertainty estimation

ABSTRACT

Ammonia, one of the ambient gasses that require environmental monitoring, is typically measured using a passive sampling method. The present work presents an evaluation of the uncertainty according to the Guide to the Expression of Uncertainty in Measurement for the measurement of the atmospheric ammonia concentration as determined by an Ogawa passive sampler, using a colorimetric method. The analytical results report the uncertainty only as a standard deviation of repeated measurements, but not all sources of uncertainty are considered. In this work, the major sources of uncertainty in the measurements are identified as contributions to the linear least-square regression lines, repeatability and recovery. The result, including the expanded uncertainty ($k = 2$) at a level of confidence of 95%, is 39.2%. The aforementioned results indicate that the Ogawa sampler can be successfully deployed to estimate the atmospheric NH_3 and could find wide application in environmental monitoring. However, to obtain correct conclusions, the uncertainty in the measurements must be considered.

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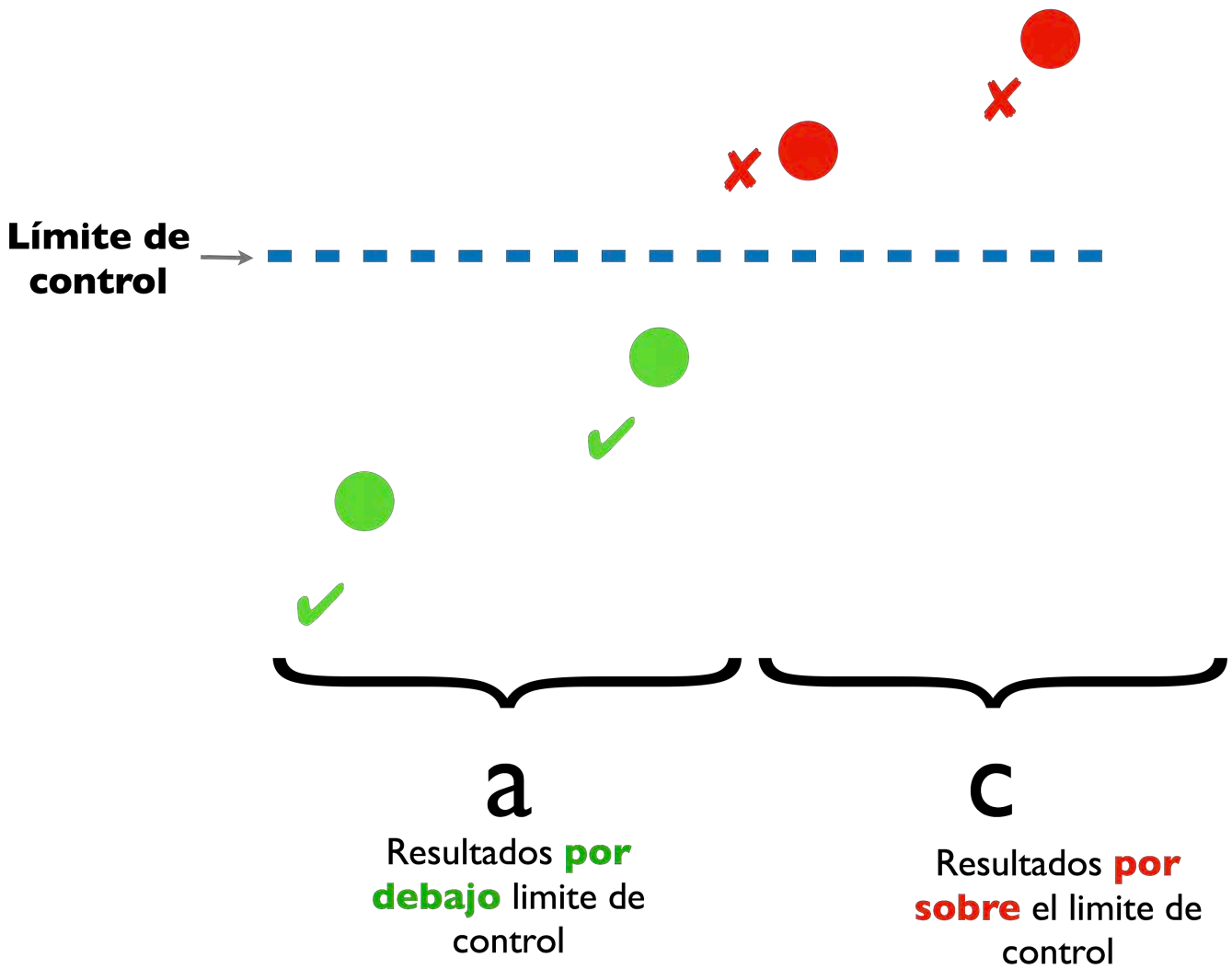
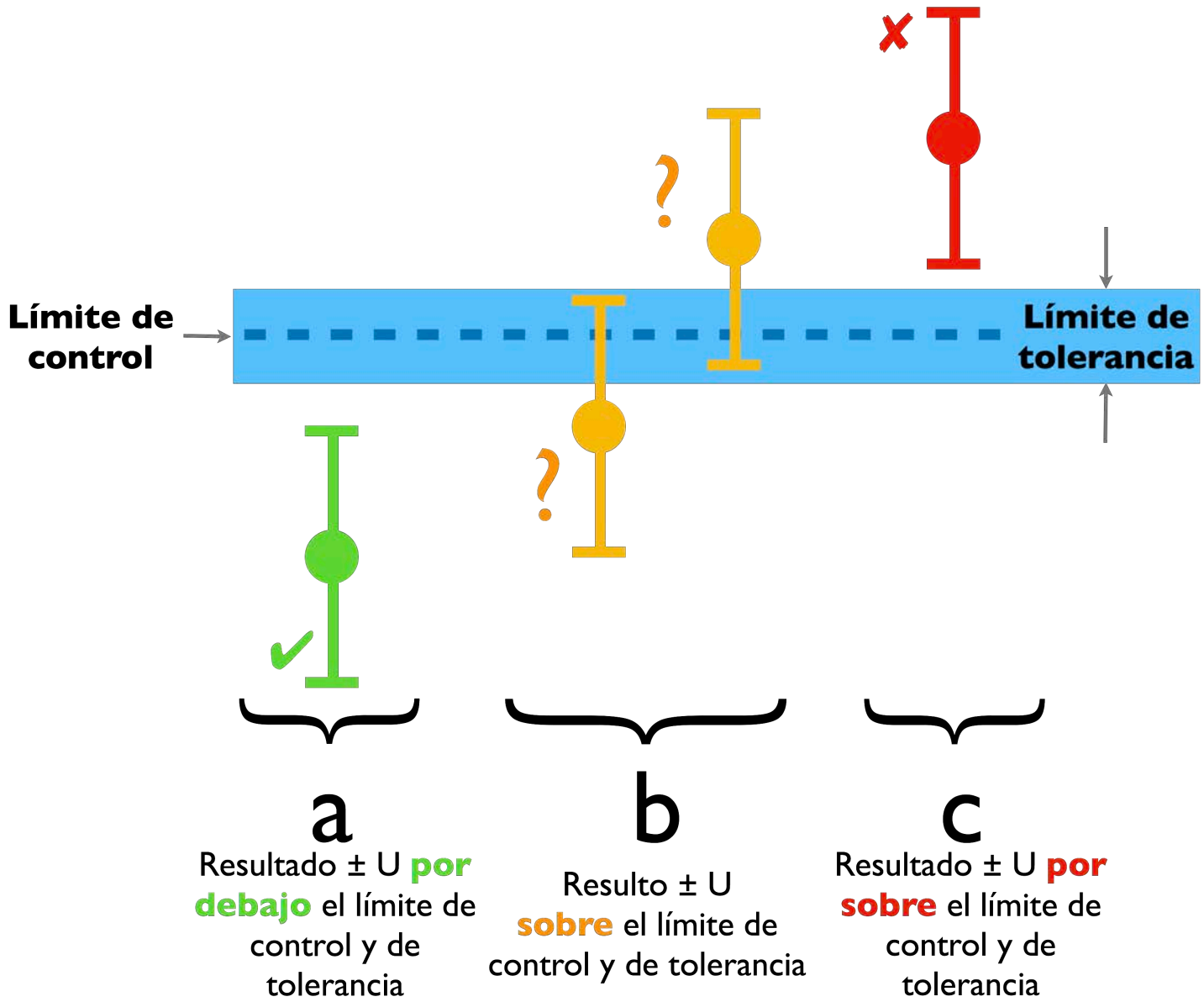
Microchemical Journal 110(2013) 340-349; doi.org/10.1016/j.microc.2013.05.004

Variabilidad e incertidumbre



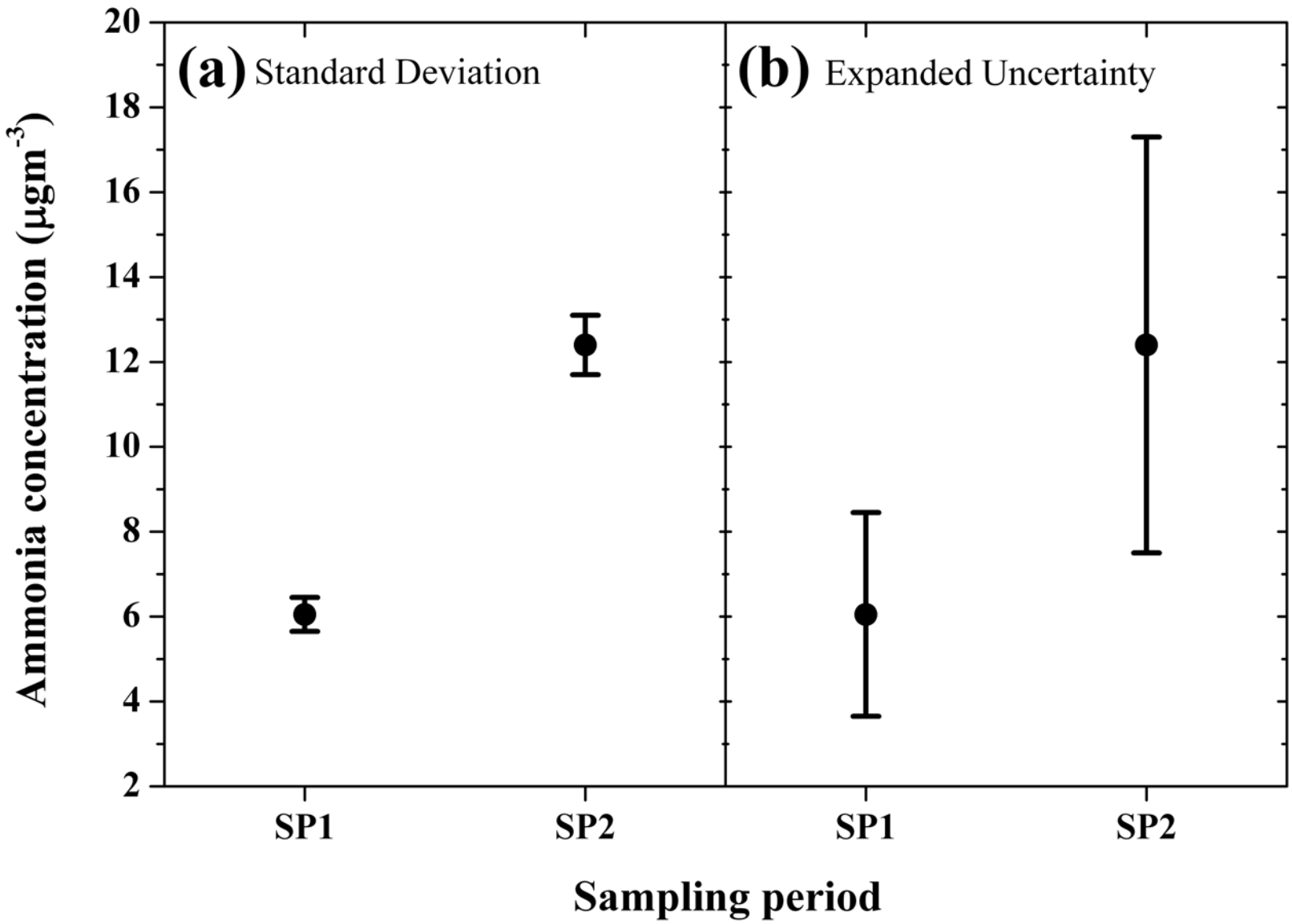
"S L R Ellison and A Williams (Eds). Eurachem/CITAC guide: Quantifying Uncertainty in Analytical Measurement, Third edition, (2012) ISBN 978-0-948926-30-3. Available from www.eurachem.org."

Variabilidad e incertidumbre



"S L R Ellison and A Williams (Eds). Eurachem/CITAC guide: Quantifying Uncertainty in Analytical Measurement, Third edition, (2012) ISBN 978-0-948926-30-3. Available from www.eurachem.org."

Para decidir bien… hay que medir



Microchemical Journal 110(2013) 340-349; doi.org/10.1016/j.microc.2013.05.004

Para decidir bien… hay que evaluar bien

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"EVALUACIÓN DE HERRAMIENTAS DE CONTROL DE LA CONTAMINACIÓN POR MATERIAL PARTICULADO EN CIUDADES DEL SUR DE CHILE"

Seminario de Título entregado a la Universidad de Chile en cumplimiento parcial de los requisitos para optar al Título de

Químico Ambiental.

Carolina Alejandra Molina Pavez

Director del Seminario de Título: Dr. Manuel Leiva Guzmán

Para decidir bien… hay que evaluar bien

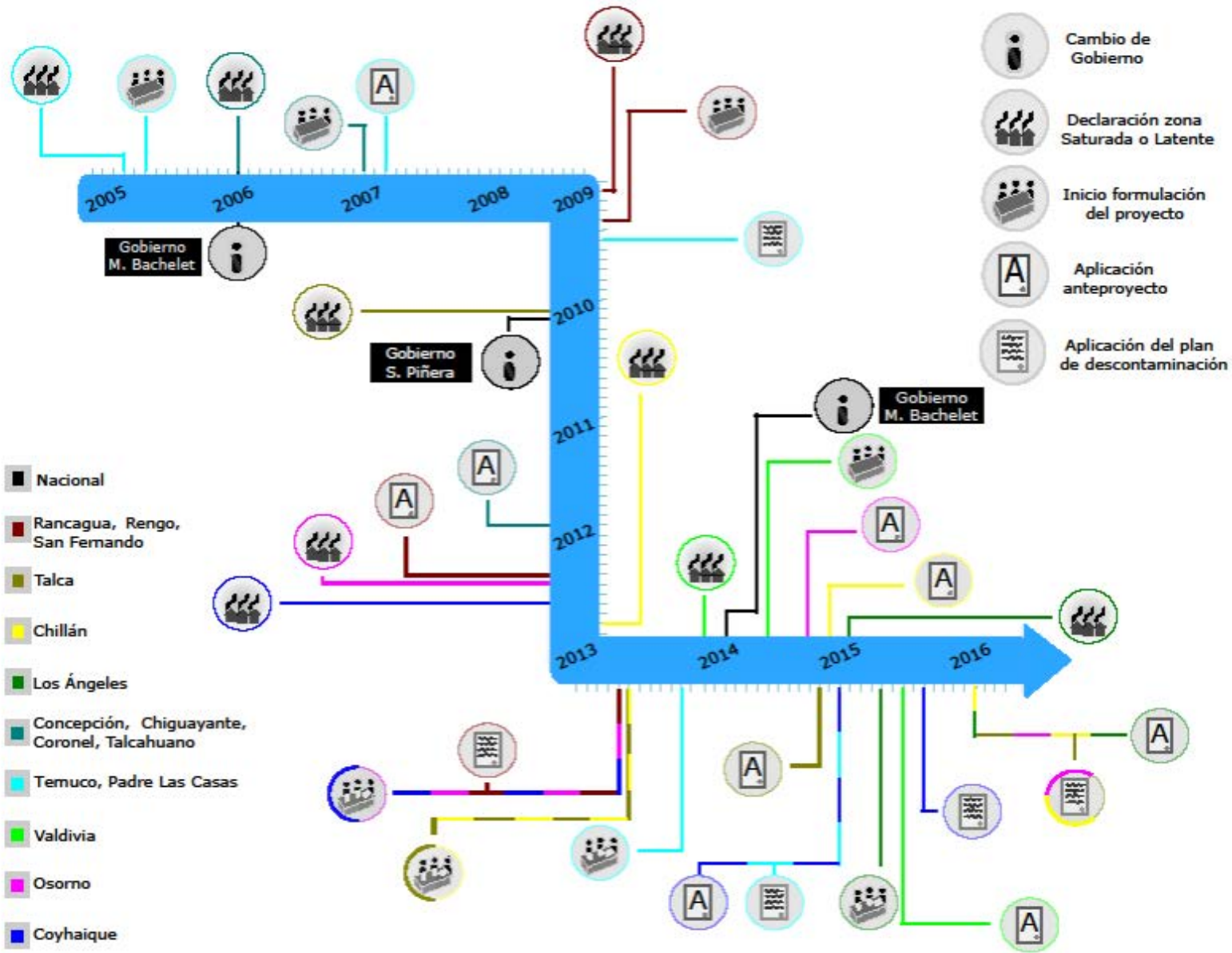
Tesis

- Edificaciones térmicamente más eficientes.
- Leña sustentable y de calidad.
- Uso de otros derivados de madera para calefacción.
- Tecnologías de calefacción más eficientes.
- Institucionalidad.
- Educación.

Contenido de los planes, principales medidas y ejes de trabajo

El deseo…

Formulación Planes de Descontaminación



Formulación Planes de Descontaminación

81% quema de leña residencial

Fuentes de emisión de $PM_{2.5}$

Tabla Número de parque y meta equipos a leña, % de recambio calefactores.

PDA	Parque actual	Meta de PDA	Recambiado	% A recambiar	% Recambiado	% Por recambiar
Valle LBO	130.000	12.000	1.428	9,2	12	88
TL	35.114	13.000	706	37	5,4	95
CLL	49.176	10.000	500	20	5,0	95
TM y PL	74.440	12.000	5.037	16	42	58
*		27.000	5.037	36	19	81
VL	44.125	26.000	500	59	1,9	98
OS	49.756	25.000	500	50	2,0	98
CY	23.000	10.000	3.447	44	35	66

*TM y PL plan actualizado

Recambio de calefactores

Air Quality Atmosphere and Health 10 (2017) 653. https://doi.org/10.1007/s11869-017-0459-y

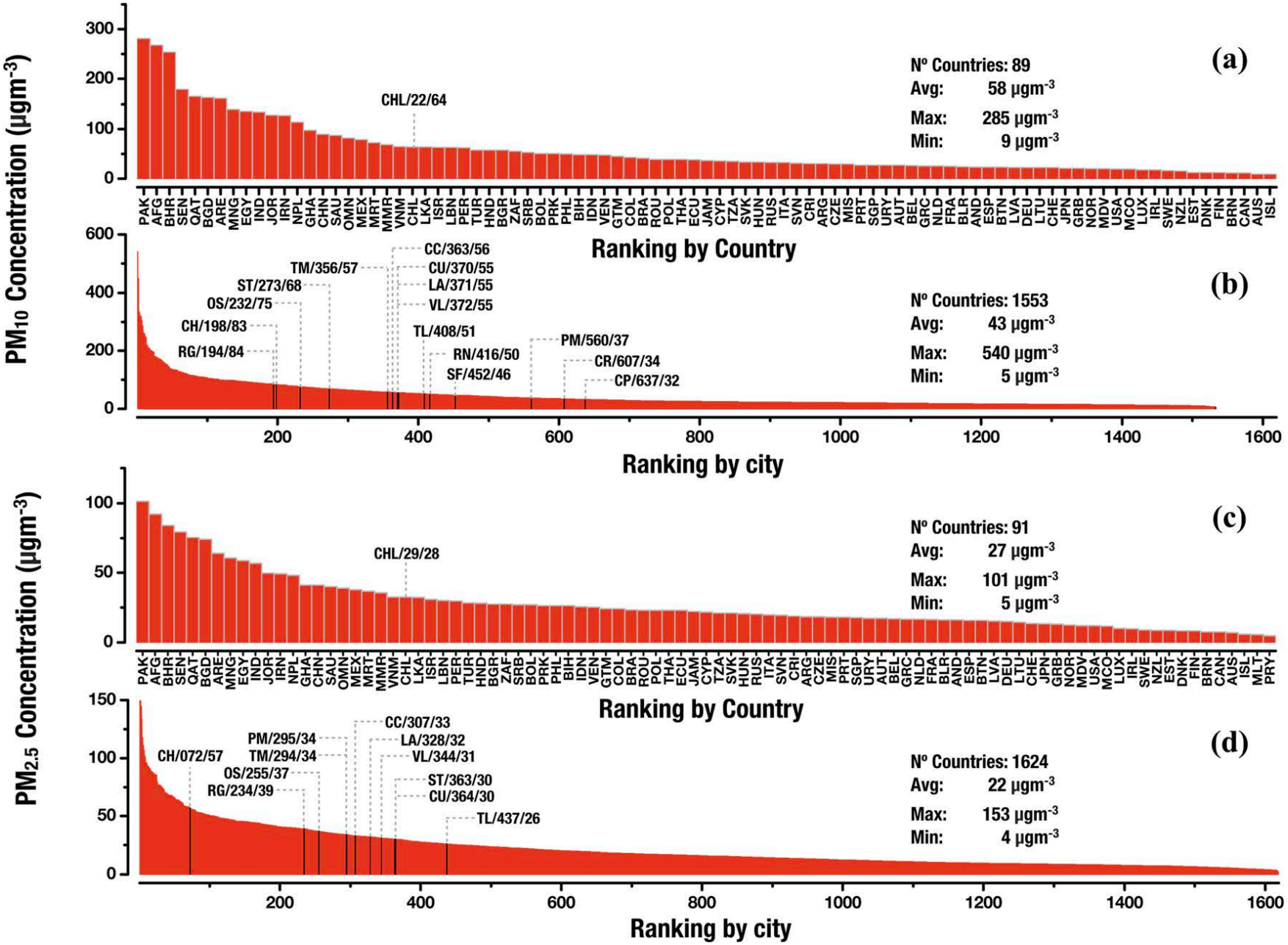
Particulate matter in urban areas of south-central Chile exceeds air quality standards

Carolina Molina[1] · Richard Toro A[1] · Raúl G.E Morales S[1] · Carlos Manzano[1]
Manuel A. Leiva-Guzmán[1]

Abstract This study analyzed air quality in terms of the concentrations of sub-10 μm (PM_{10}) and sub-2.5 μm particulate matter ($PM_{2.5}$) recorded at 23 automated public monitoring stations located in 16 cities in south-central Chile (Rancagua, Rengo, San Fernando, Curicó, Talca, Maule, Chillán and Chillán Viejo, Gran Concepción, Coronel, Los Ángeles, Temuco and Padre Las Casas, Valdivia, Osorno, Puerto Montt, Coyhaique, and Punta Arenas). In each city, the spatial and temporal distributions of the PM_{10} and $PM_{2.5}$ concentrations were recorded at daily, monthly, and yearly intervals. Air quality was evaluated by comparing the annual average concentrations and the maximum daily concentrations of PM_{10} and $PM_{2.5}$ with the World Health Organization (WHO) and national standards. The results showed that the limits established in the WHO guidelines and the national standards were systematically exceeded at all the study sites. The highest concentrations of both PM_{10} and $PM_{2.5}$ were observed during the fall and winter months (April to September), i.e., the cold period of the year, whereas the lowest concentrations were recorded in the spring and summer months (October to March), i.e., the warm period of the year. Analysis of variance (ANOVA) of the data collected in the warm and cold periods showed that all stations in this study exhibited statistically significant differences between these two periods. During cold periods, burning firewood for heating produces emissions that are a main source of PM. Furthermore, firewood is primarily burned at night when the lowest temperatures occur and when the atmospheric conditions are generally unfavorable for dispersion; thus, pollution accumulates the above cities. The levels of $PM_{2.5}$, the most important type of pollution, exceeded the limit established by the WHO on at least one third of the days of the year (>120 days) in the cities of Rancagua, Rengo, Curicó, Talca, Chillan, Los Angeles, Temuco, Valdivia, Osorno, Puerto Montt, and Coyhaique. Therefore in the cities in southern Chile, the population is exposed to particulate matter concentrations that can have negative health impacts. To improve the air quality conditions in the studied cities, research on heaters and combustion techniques should be promoted, home energy efficiency should be increased to reduce firewood consumption, the firewood certification process should be improved at the national level with a better auditing processes, and the introduction of alternative fuels should be considered for greater energy efficiency at competitive costs.

Keywords Particulate matter · Air pollution assessment · Chile · Urban areas

Para decidir bien… hay que evaluar bien



Para decidir bien… hay que evaluar bien

Air Quality Atmosphere and Health 10 (2017) 653. https://doi.org/10.1007/s11869-017-0459-y

Landfill fire and airborne aerosols in a large city: lessons learned and future needs

Air Qual Atmos Health
https://doi.org/10.1007/s11869-017-0522-8

Raúl G. E. Morales S.[1] · Richard Toro A.[1] · Luis Morales[2] · Manuel A. Leiva G.[1]

Abstract Landfill fires are relatively frequent incidents that can result in severe environmental impacts. On the morning of January 15, 2016, a fire occurred at the Santa Marta landfill (Lf) in the metropolitan area of Santiago (SMA), Chile. The fire triggered public alarm. In the present work, the impact of the landfill fire on the air quality of the SMA and the possible impacts on human health are analyzed. According to the information collected, the fire began after a collapse in the landfill on January 15, 2016. The fire could not be controlled by the Lf operating company, and authorities acted late in responding. The results revealed that at the focal point of the fire, particulate matter with an aerodynamic diameter smaller than 2.5 μm ($PM_{2.5}$) reached concentration levels on the order of 1000 μg m^{-3}. Three days after the start of the fire, hourly $PM_{2.5}$ concentration levels above 200 μg m^{-3} were recorded, at a distance approximately 20 km northeast of where the fire occurred. The $PM_{2.5}$ concentration levels recommended for the protection of the health of vulnerable persons were subsequently exceeded. These results suggest that a preventive measure should have been the evacuation of the most pollution-sensitive population. An inappropriate management of the emergency was demonstrated. Legislation should be improved by stipulating which sanitary Lfs should be equipped with firefighting equipment. Territorial planning should be improved by considering geographic and meteorological aspects.

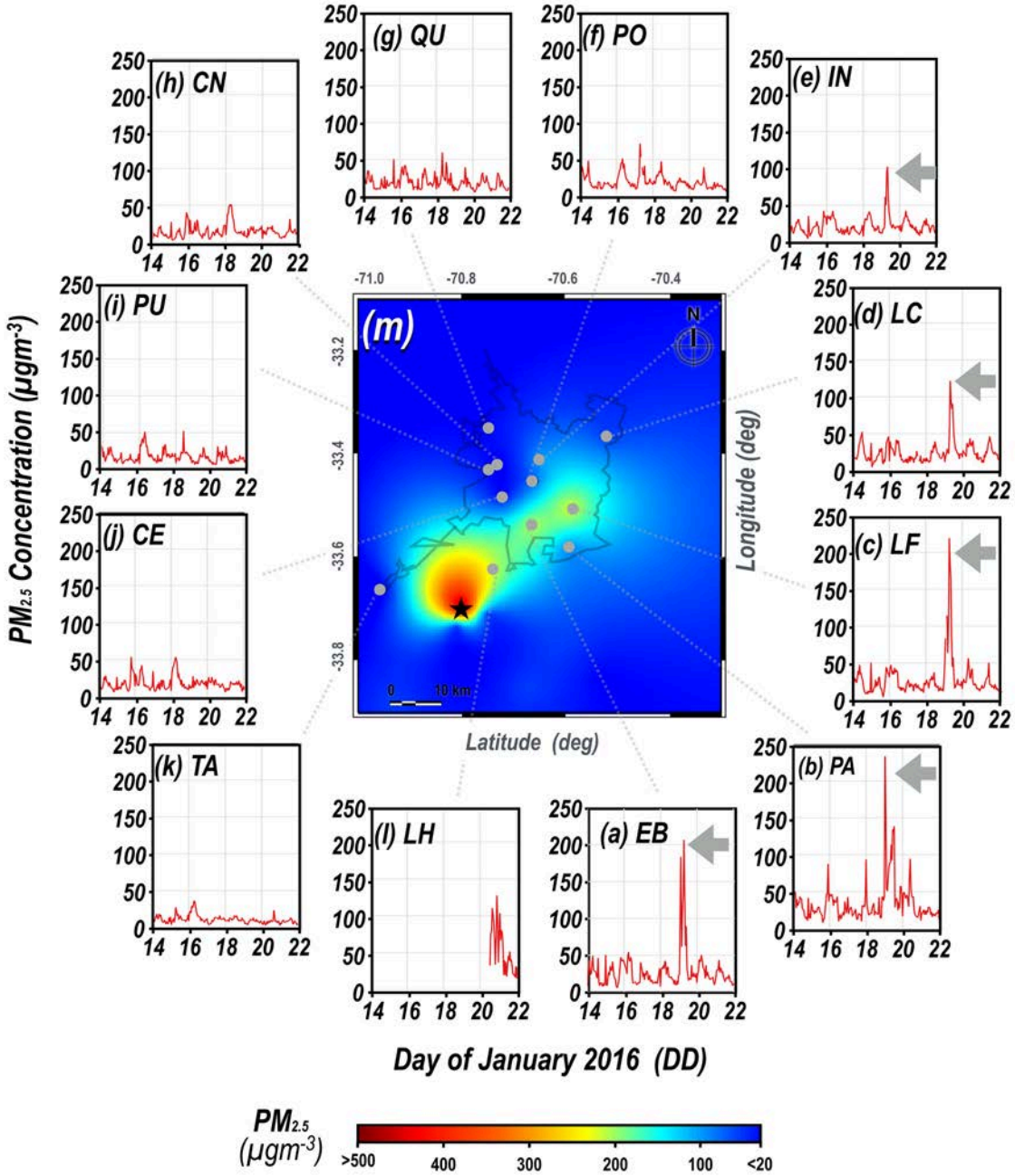
Y que paso

Air Quality Atmosphere and Health (2017) https://doi.org/10.1007/s11869-017-0522-8

Fri 15 Jan (day 1)	Sat 16 Jan (day 2)	Sun 17 Jan (day 3)
landfill Landslide Bad odors report near landfill	**Report to sanitary authority** Bad odors near landfill	Bad odors near landfill
Mon 18 Jan (day 4)	**Tue 19 Jan (day 5)**	**Wen 20 Jan (day 6)**
fire begins Report to environmental authority and local government	**Fire extinguishing** Santiago under the smoke	**Fire extinguishing** Santiago bad odors
Thu 21 Jan (day 7)	**Web 20 Jan (day 8)**	
Fire extinguishing ***Monitoring station installation***	**Fire extinguished**	

Cronología

Air Quality Atmosphere and Health (2017) https://doi.org/10.1007/s11869-017-0522-8



Y que paso

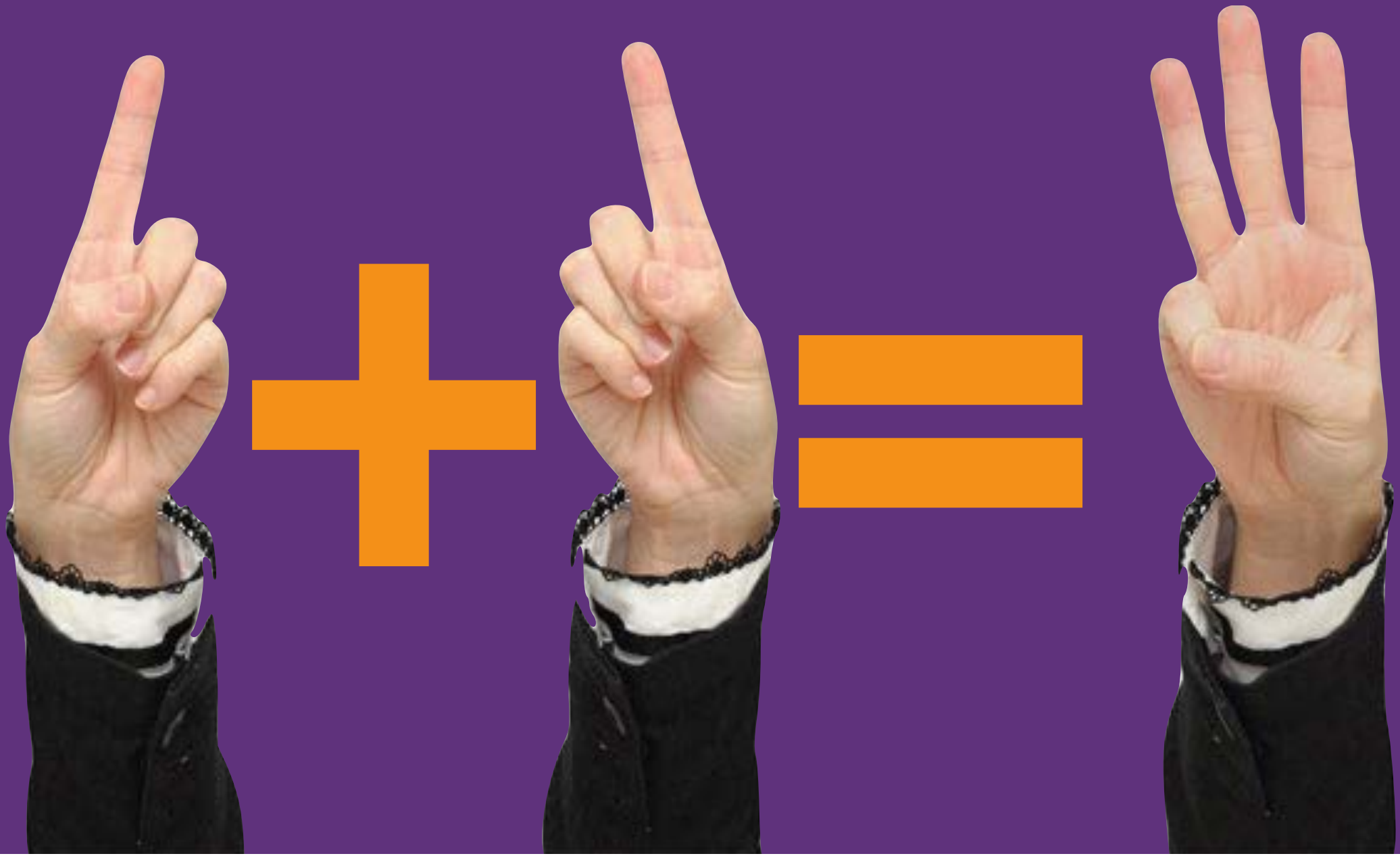
Air Quality Atmosphere and Health (2017) https://doi.org/10.1007/s11869-017-0522-8

CUESTIONES (IDEAS) PARA SU (NUESTRA) CONSIDERACION

Cocktail (Mix)

Toxicidad y Concentración

Sinergia

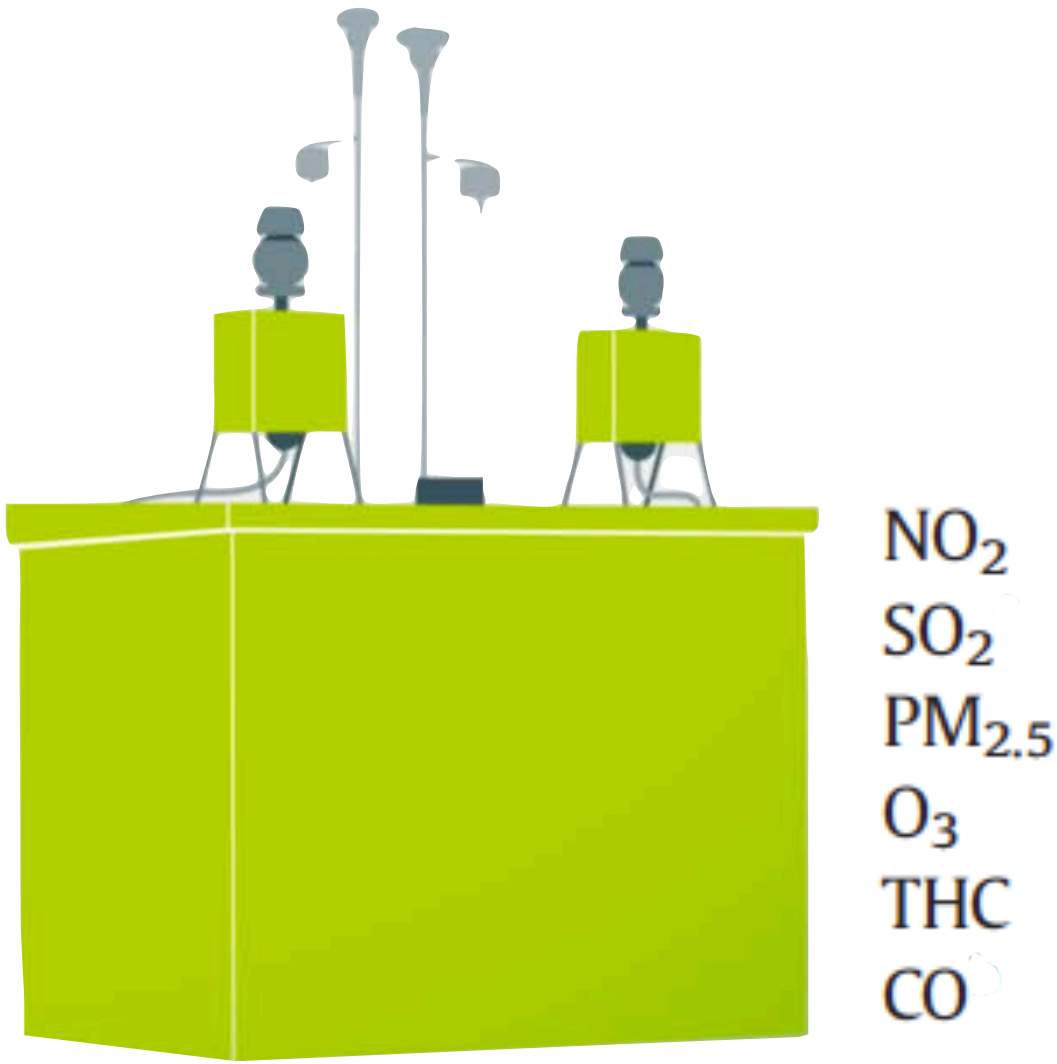


Mediciones

Para la
toma de decisiones

Disponibilidad
para todos

Entender la
contaminación



Meteorología (T, HR, P, RS, ws y wd)

Información de calidad

Las decisiones ambientales requieren de información de calidad, creíbles científicamente y defendibles legalmente.

Proceso Inflamatorio

↓

Estrés oxidativo

Paradigma

EXPOSICIÓN
(emision)
EVALUACIÓN DE RIESGOS
(inmisión)
GESTIÓN DE RIESGOS
(manejo)
Fuentes
Transporte y Transformaciones
Concentraciones Ambientales
Exposición
Efectos en Salud
Efectos biológicos
Evaluación de efectos enSalud
Exposición-Dosis-Respuesta Caracterización
Evaluación de Riesgo
Opciones de manejo de riesgo
Evaluación de la Exposición
Consideraciones Políticas, económicas y sociales
Salud Publica
Consideraciones Legales
Gestion de riesgo
Evaluación de exposición y de mejoras en la salud pública
EVALUACIÓN DE ACCIONES DE MEJORA

CONICYT
Ministerio de Educación
Gobierno de Chile

FONDECYT
Fondo Nacional de Desarrollo
Científico y Tecnológico

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