

# Monitoring Equipment for Black Carbon

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## *Health- global warming*

PM2.5 fine particles (with diameters of 2.5 microns) detached from black carbon (BC) subjected to industrial processes and other sources

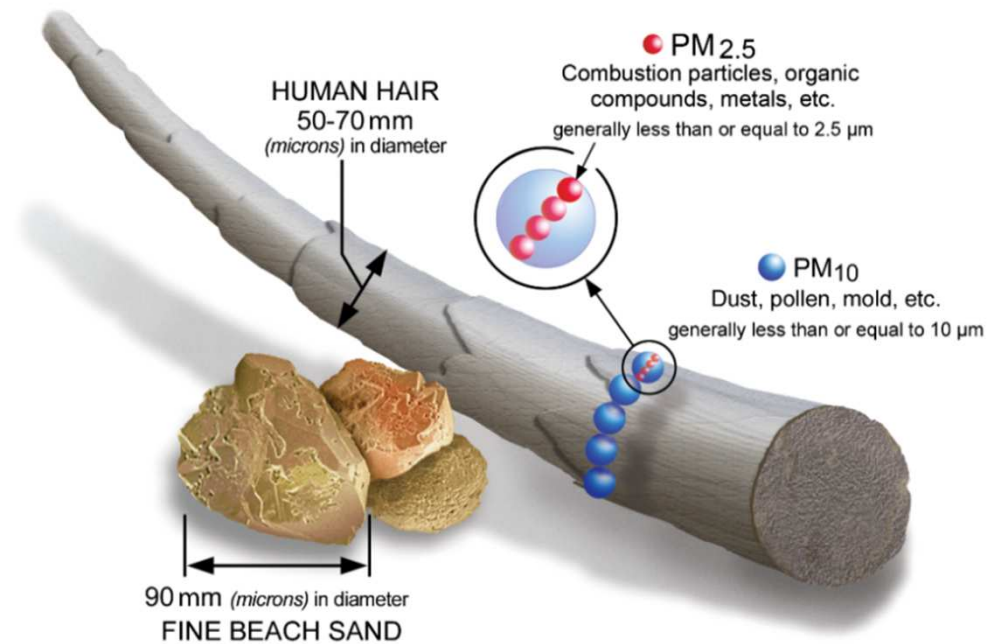
Its effect on health, as well as its properties contributes to global warming.

# *Statistics*

- According to the World Health Organization, 92% of the world population breathes air with concentrations above the levels recommended as safe.
- It is estimated that every year 7 million people die prematurely as a result of the effect of intra and extra-domestic conditions.

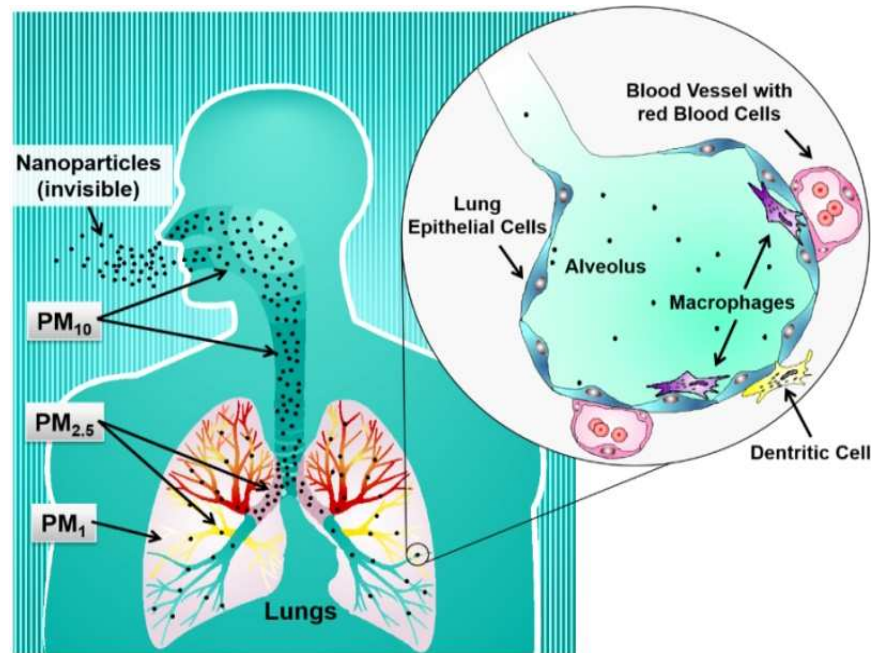
# Particle size

Source: <https://www.epa.gov/pm-pollution/particulate-matter-pm-basics>



The respiratory system constitutes the main way of entrance to the organism for atmospheric particulate material

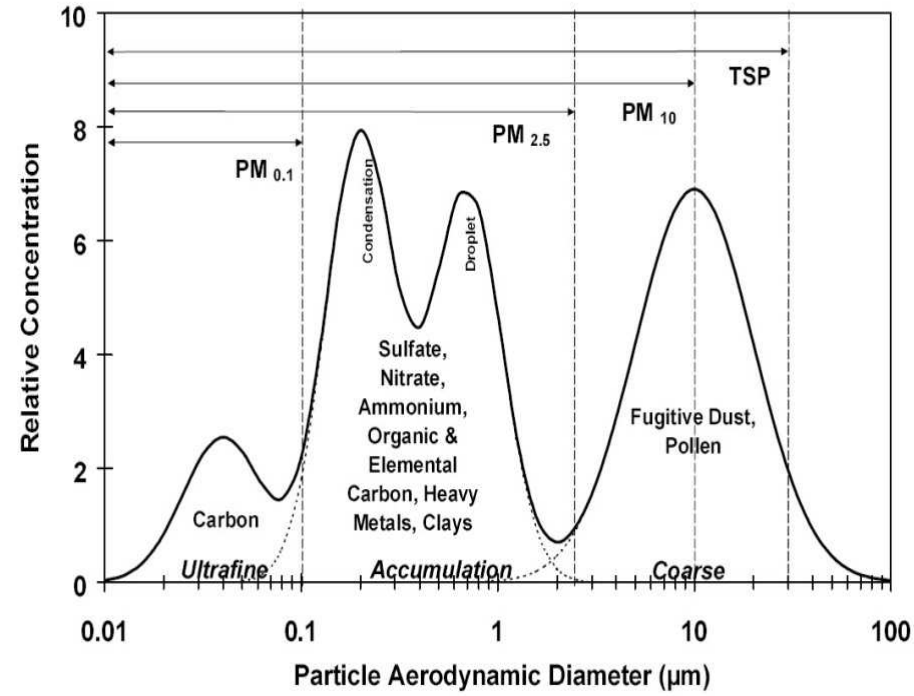
# *Danger to health*



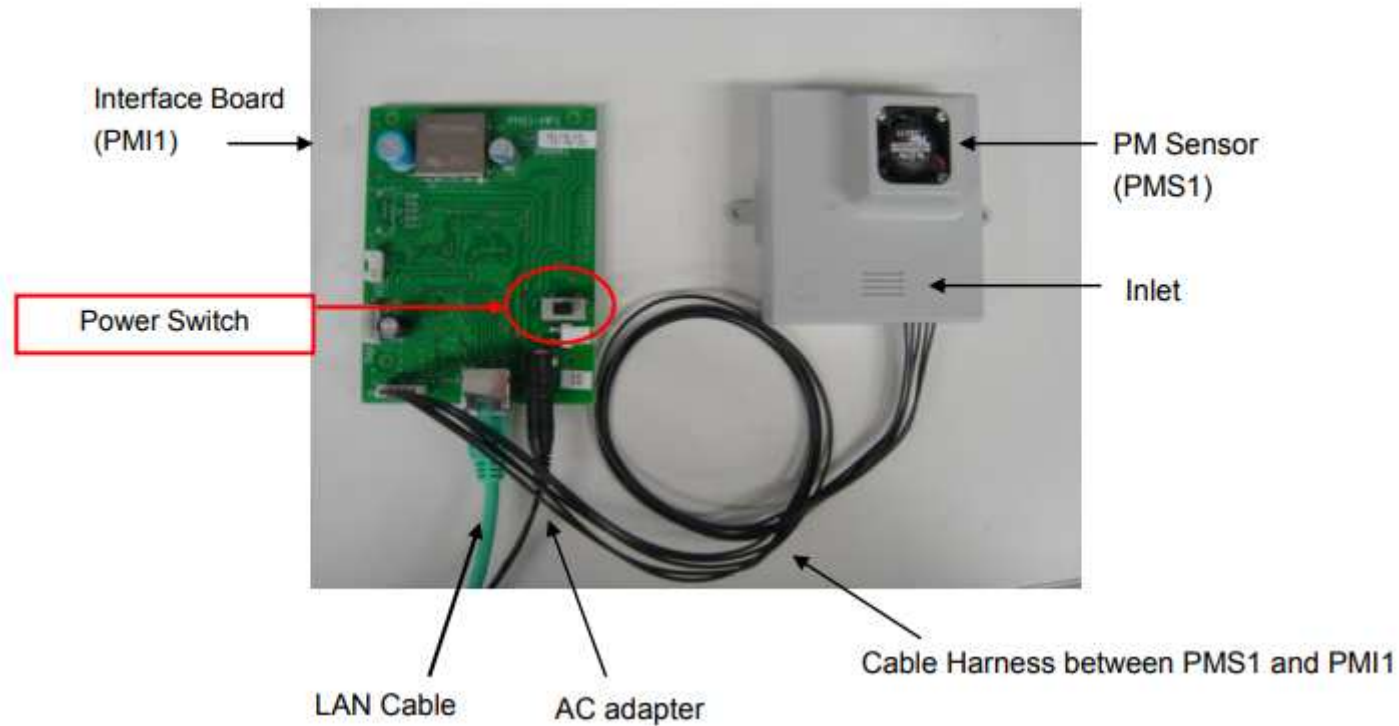
Adapted with permission from Krug H.F., Wick P. (2011). Nanotoxikologie – eine interdisziplinäre Herausforderung. *Angewandte Chemie*, 123(6): 1284–1314. Copyright © 2016 John Wiley and Sons.

**Source:** KRUG H.F., WICK, P. Nanotoxicology: an interdisciplinary challenge. *En: Angewandte Chemie International Edition*, 2011, vol. 50, no 6, p. 1265

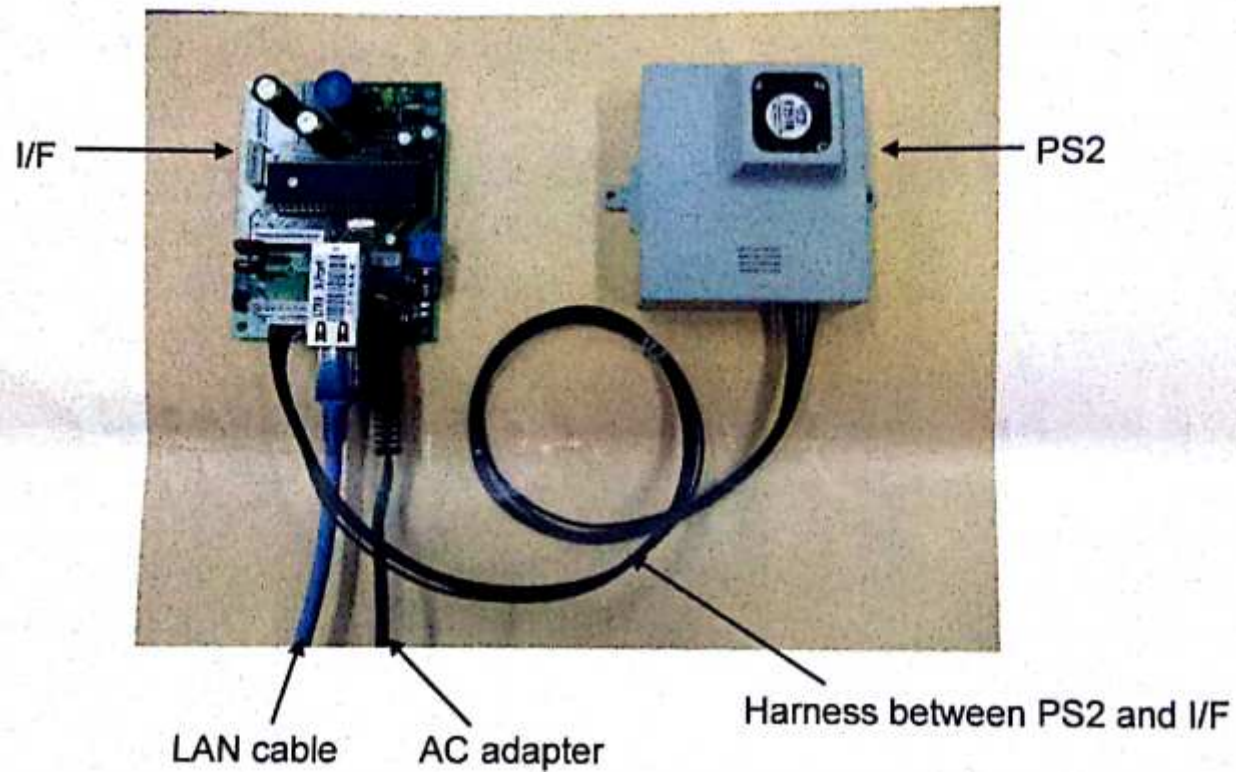
**Source:** WATSON J.G., CHOW J. Reconciling urban fugitive dust emission inventory and ambient source contribution estimates



# Sensor PM2.5



# Sensor PM10



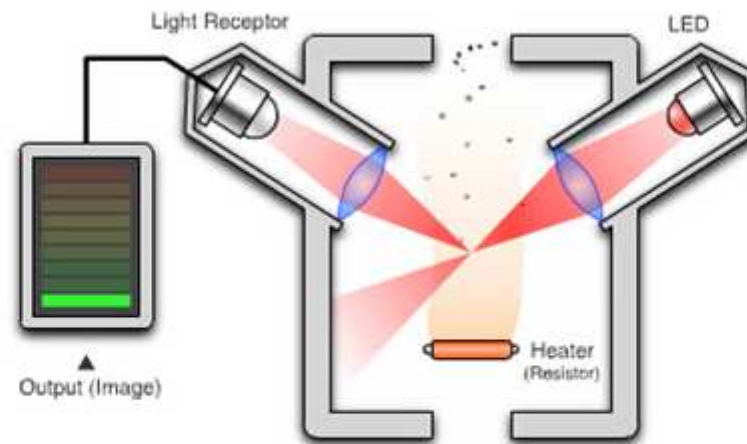


# Thermometer Shelter



Example of Installation of PM Sensor and Interface Board in Thermometer Shelter

# Simplified Scheme of a Shinyei Sensor

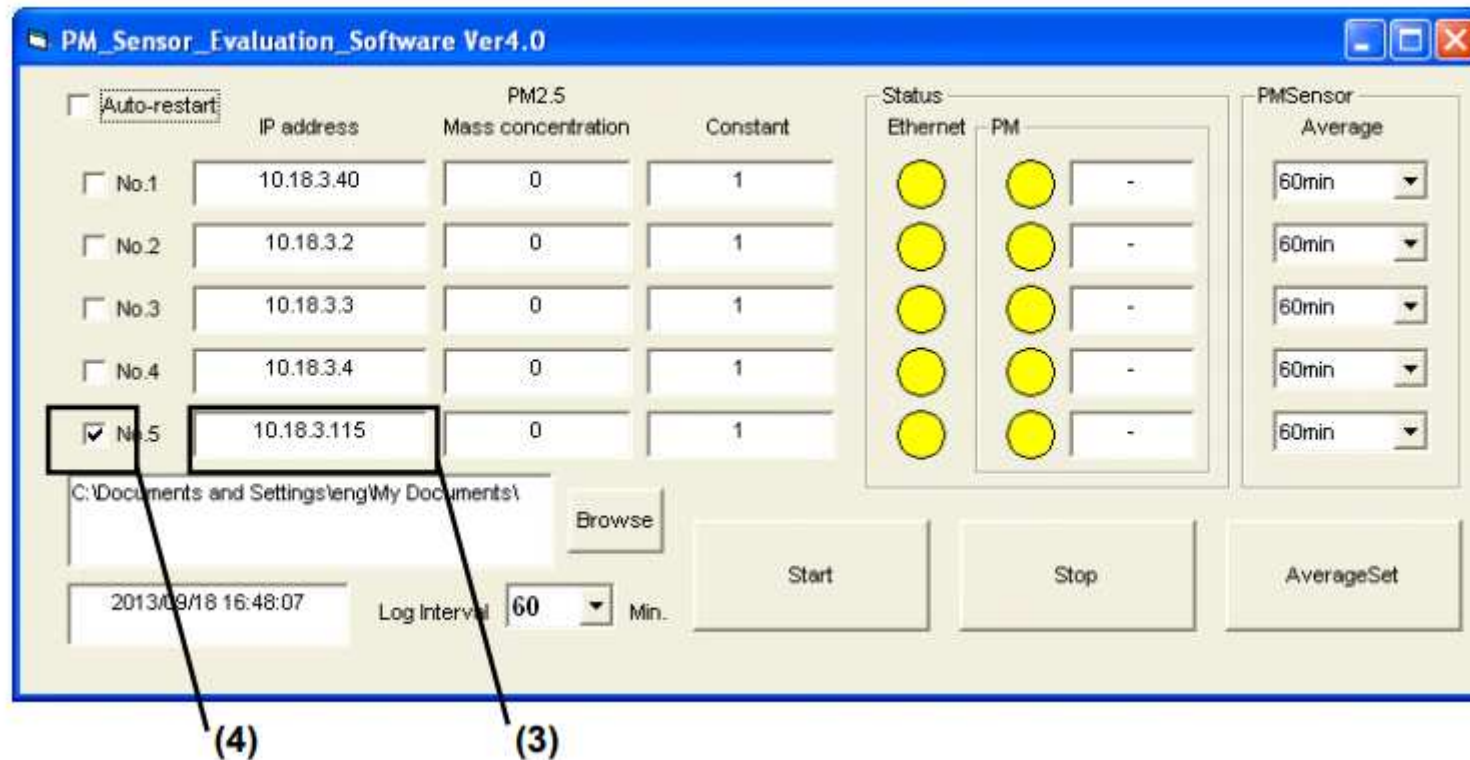


**Fuente:** [PPD42NJ Particle Sensor Unit](http://www.shinyei.co.jp/stc/eng/optical/main_ppd42.html) [en línea]. [Shinyei Technology](http://www.shinyei.co.jp/stc/eng/optical/main_ppd42.html)  
[Consultado abril de 2016]. Disponible en internet:  
[http://www.shinyei.co.jp/stc/eng/optical/main\\_ppd42.html](http://www.shinyei.co.jp/stc/eng/optical/main_ppd42.html)  
[Consultado abril de 2016]. Disponible en internet:  
[http://www.shinyei.co.jp/stc/eng/optical/main\\_ppd42.html](http://www.shinyei.co.jp/stc/eng/optical/main_ppd42.html)

# Measurement

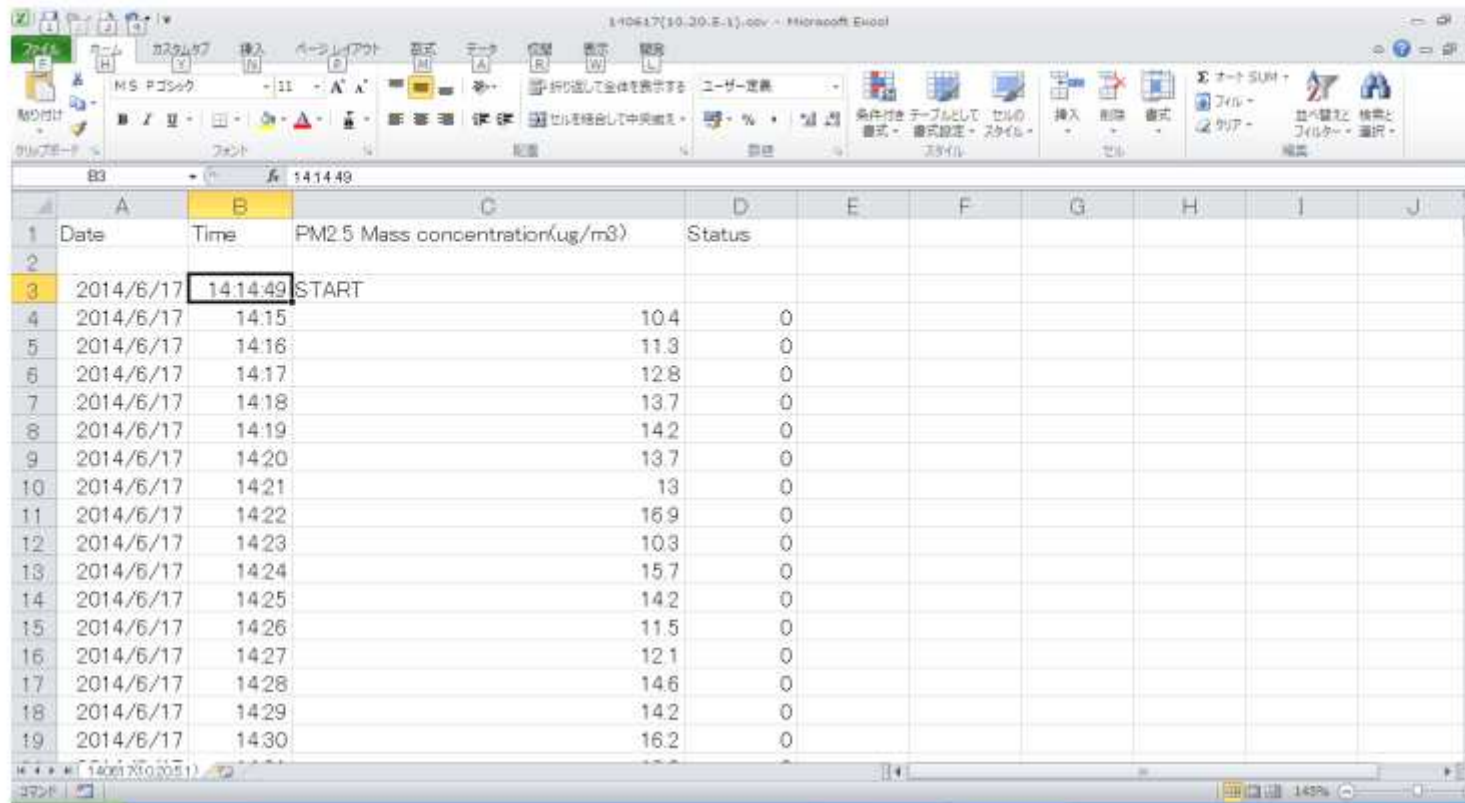
## 1, 5, 10, 15, 30 or 60 min

measurement.



# Status Information is stored in CSV Format File ( $\mu\text{g}/\text{m}^3$ )

< Sample of Measured Data in CSV Format File >



The screenshot shows a Microsoft Excel spreadsheet with the following data:

	A	B	C	D	E	F	G	H	I	J
1	Date	Time	PM2.5 Mass concentration(ug/m3)	Status						
2										
3	2014/6/17	14:14:49	START							
4	2014/6/17	14:15	104	0						
5	2014/6/17	14:16	113	0						
6	2014/6/17	14:17	128	0						
7	2014/6/17	14:18	137	0						
8	2014/6/17	14:19	142	0						
9	2014/6/17	14:20	137	0						
10	2014/6/17	14:21	13	0						
11	2014/6/17	14:22	169	0						
12	2014/6/17	14:23	103	0						
13	2014/6/17	14:24	157	0						
14	2014/6/17	14:25	142	0						
15	2014/6/17	14:26	115	0						
16	2014/6/17	14:27	121	0						
17	2014/6/17	14:28	146	0						
18	2014/6/17	14:29	142	0						
19	2014/6/17	14:30	162	0						

# *Intercalibration*

This guarantees reliability in the measurements

It is easy to transport

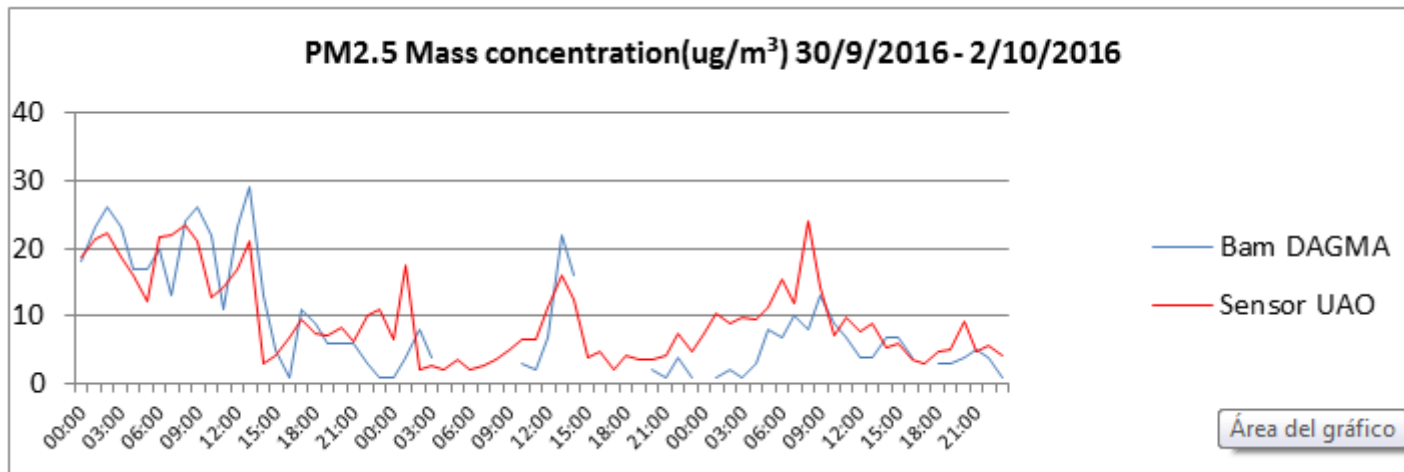


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# Measurements



The values recorded in Graph by the two devices are in the same range from 0 to 30  $\mu\text{g} / \text{m}^3$  and the readings show a marked correlation. The highest values to the left of the graph correspond to the day Friday when there is an intensification of the vehicular flow especially in this sector of the city and the lowest values are consistent with the reduction of the automotive traffic of the weekend (Saturday and Sunday)

# *Station to monitor weather variables*

## *“Meteorology”*



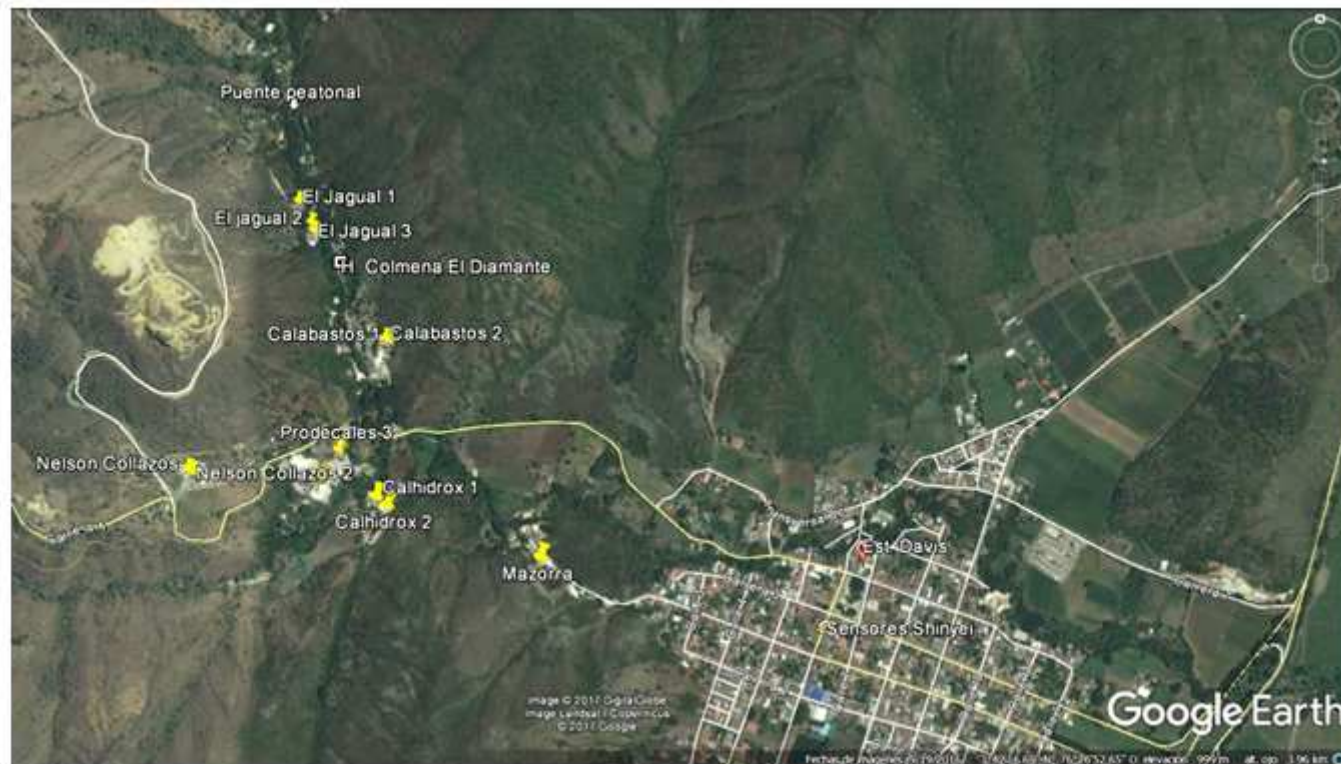
Temperature  
Wind direction  
Wind speed  
Humidity



Solar radiation  
Atmospheric pressure

# Vijes City

## Lime-producing Ovens





# AerViro Software

- It was created 30 years ago by meteorological Institute of Sweden.
- Subject to permanent update
- Information processing and dispersión model
- Generate graphics
- The data is grouped in time series
- Automate tasks
- statistics analysis
- Modeling the dispersion of the particulate material

# Meetings to analyze results

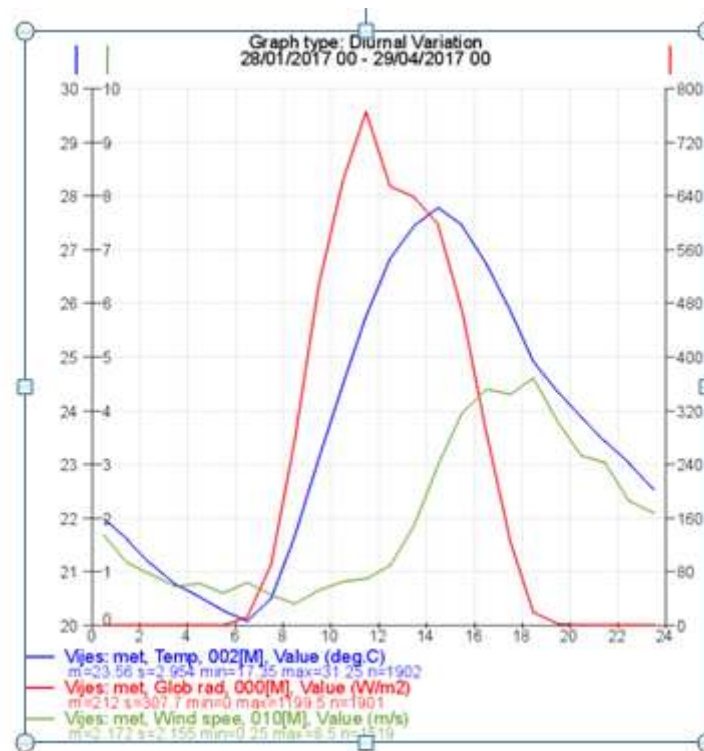


# Results obtained by Rafael Contreras

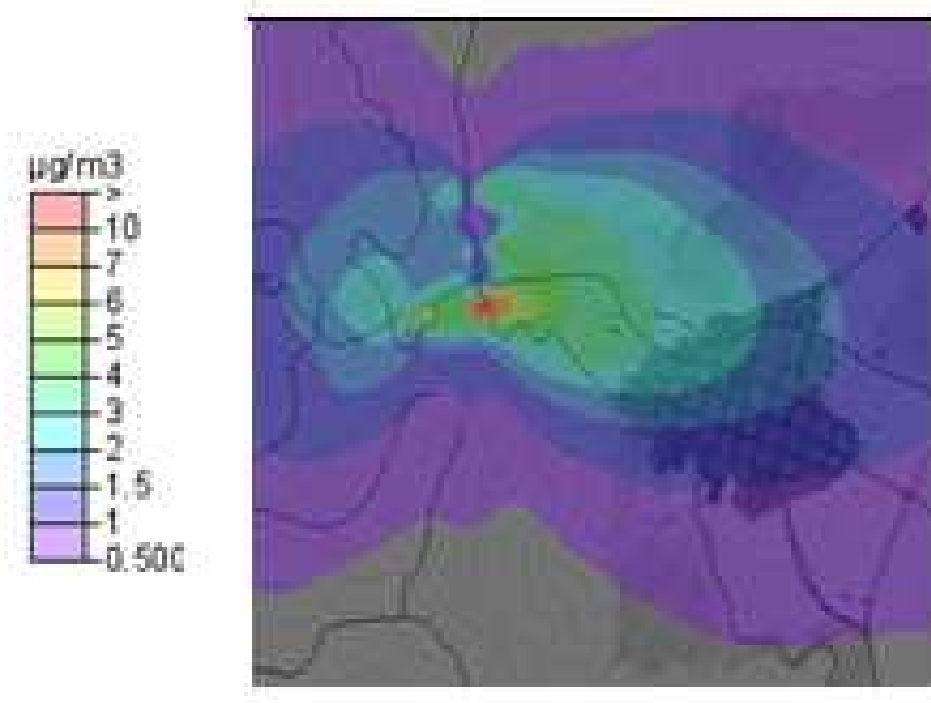
T: Blue

Intensity: Red

Speed wind:  
Green

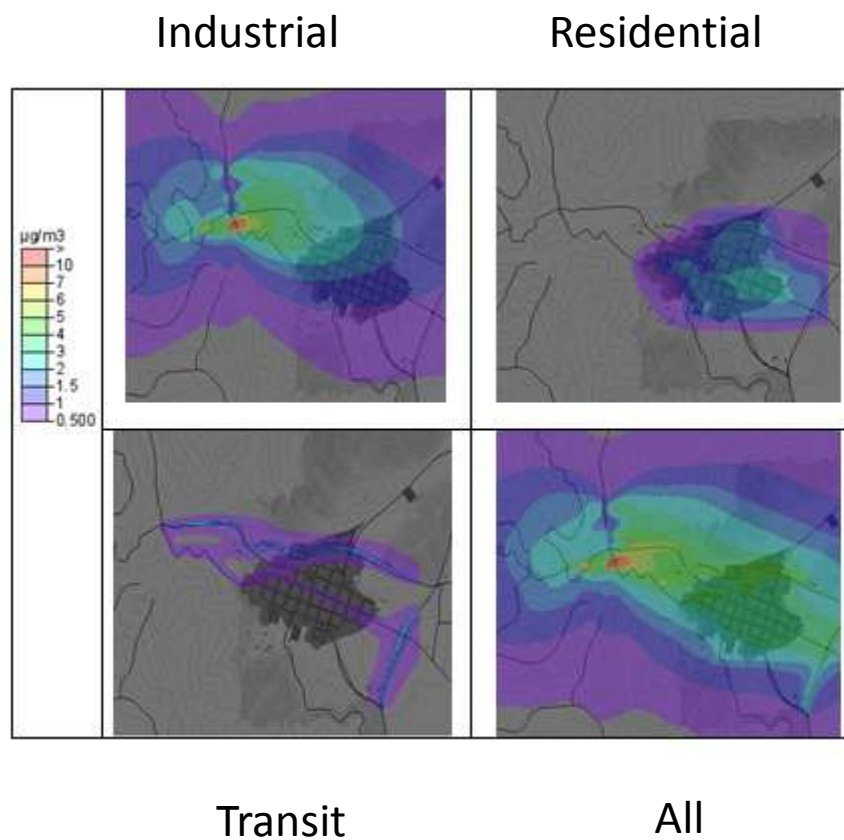


# *Results obtained by Rafael Contreras*



# *Own elaboration using AirViro Software*

## *Results obtained by Rafael Contreras*



# *Air Quality Lab UAO*

- 8 Optic sensors
- 4 Thermometric Shelters
- 4 PC
- UPS
- Inversors with Rechargeable batteries
- Weather Station
- AirViro Software

# *Training*



# *Training*





- *Many Thanks*