

## MEASUREMENT OF AMBIENT CARBON MONOXIDE AT THE ASUNCION CITY.

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### ABSTRACT

Paraguay is not outside of the problems related to the atmospheric contamination, in special to vehicular pollution that it is known well cause serious problems in the health of the man, the carbon monoxide (CO) is a toxic gas formed in all burning processes under insufficient oxygen conditions, his danger its increases especially due to his properties of being a colourless and odourless gas.

Accumulation of CO in the atmosphere is of concern to us, because its accumulation degrades the ambient air quality. Around the Metropolitan area of Asunción daily 2,500 vehicles are circulating emitting polluting to the atmosphere. Measurement of ambient CO was carried out using a Carbon Monoxide Meter CO10 of Extech Instruments, of 1 ppm of resolution and precision of  $\pm 5\%$  in the micro centre zone of the Asunción city (25-16S, 57-38W), was measured only during the daytime. Preliminary results indicate that the CO ambient values are between 2.5 and 67.5 ppb, present diurnal variation and its response to land breeze is evident. The level of emission is intense in the rush hours of circulation and depends of the wheatear conditions.

### INTRODUCTION

The polluting agents of the air can originate negative impacts on the health of the people when their air concentrations surpass significant levels. The contamination of the air is generated by a great amount of sources of emission one of them are the automotive vehicles. The automotive vehicles and specially those that consume gasoline (Mazzeo, 2003) are the most important and main emitting sources of polluting agents of the air in the urban centers.

Around Asunción and the Metropolitan area daily is circulating 2,500 vehicles (Ultima Hora, 2005), that are emitting polluting to the atmosphere mainly carbon monoxide (CO), that due to its colorless and odorless property of being is increased its danger.

Another source of CO, of comparable magnitudes is the combustion of fossil fuels, and the oxidation of the methane. At the moment also it must worry forest fires and you burn them of biomass, of agricultural remainders and vegetation that is being increased our country (Coronel et al, 2003), contributing to that great areas of the surface of the region (Fishman et al., 1991) are exposed to the increase of the CO concentration.

The carbon monoxide makes difficult to the normal transport of oxygen by the blood, reducing significant the amount of oxygen that goes to the heart, that can affect particularly the people who suffer mainly of disease cardiac and in the children (The UK National Air Quality).

The continuous exposition at high levels of CO in the air causes serious pathological effects, increasing the content of carboxihemoglobina in blood and causing adverse effects in the nervous and cardiovascular system (EPA, U.S). The problem with the contamination appears with certain gravity in those sites of the city with much automotive traffic, and great concentration of people of limited resources that are dedicated on sale informal in the streets. The damage that can not only cause a polluting agent depends on its concentration, but also on the time of exposition and the sensitivity of each person to the polluting agent at issue. The short average life of the carbon monoxide in the atmosphere (near a month) along with his varied sources implies that its concentration can vary regionally, the annual average of abundance in the North Hemisphere is around 100 - 125 ppb that it is approximately twice greater than the abundance average in the South Hemisphere of 50 - 65 (Novelli, et al., 1992). The process of dominant drain for the Carbon Monoxide is the reaction of CO with the radical hidroxilo (OH). The CO is a gas that is consumed by the hidroxilos radicals, that work like natural detergent that cleans the atmosphere of many poluentes. As the level of the CO is in increase, the abundance of the hidroxilos in the atmosphere is in diminution, and as a result of the same one the capacity decreases that has the atmosphere to clean

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the pollution. This reaction also serves like a way of greater conversion of OH to H<sub>2</sub>O. Of this east form process is important in the control of the OH and the CO in the tropósfera, the reduction of radical OH by the CO does that there is less OH available for the destruction of the methane, possibly leading to an increase of the heating by effect conservatory.

The measurements made in different critical important points from Microcentro of Asuncion indicate that the concentrations of the carbon monoxide are varying between 2,5 and 67,5 ppb, but the preoccupation comes from the consideration that the country does not count on national norms to take care of itself of the carbon monoxide.

This work presents/displays the space distributions of the emissions to the atmosphere of carbon monoxide in the Micro Center of Assumption, generated by the vehicles of automotive transport of passengers. The zones with greater relative emission are individualized and hour variations of the emissions appear.

It is important to know the horizontal distributions the emissions the atmosphere of the carbon monoxide in Microcentro of Asuncio'n, to individualize the zones with high levels of CO concentration, and its hour variations, this will allow to alert to the citizenship on the situated ones of potential risks for the human health.

#### METHOD OF MEASUREMENT.

The measurements of the carbon monoxide were made in the Micro Center of Asuncion ( see Figure 1), in working days and during the diurnal hours, hours of greater automotive traffic. A "Extech Instruments, Model CO10", of a precision  $\pm 5\%$  and calibration of factory, was used. The measurements in each site were made at intervals of 5 minutes, taking in consideration the answer from the ambient air to the change of the wind speed and its direction, and the site of measurement, at the same time to register the measurements estimativas information were written down on the temperature of the place (to see Table 1). Although the data are not of long data in the time, are of the most recent quantitative measurements made in the country.

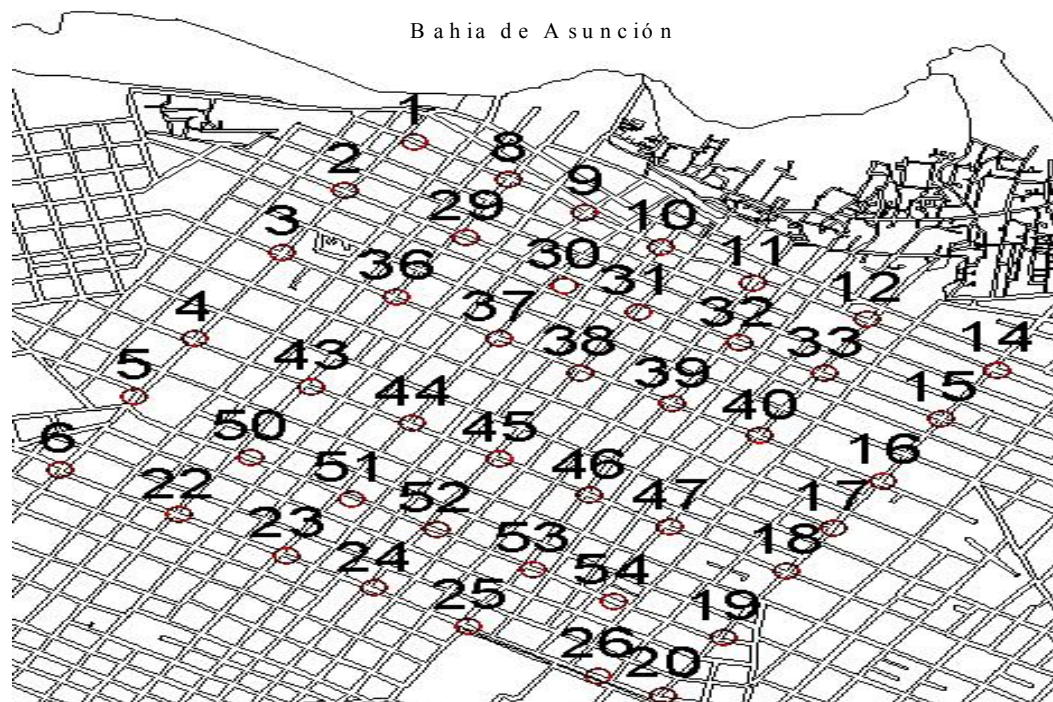


Figure 1: The site of measurements in the Micro Center of Asuncion

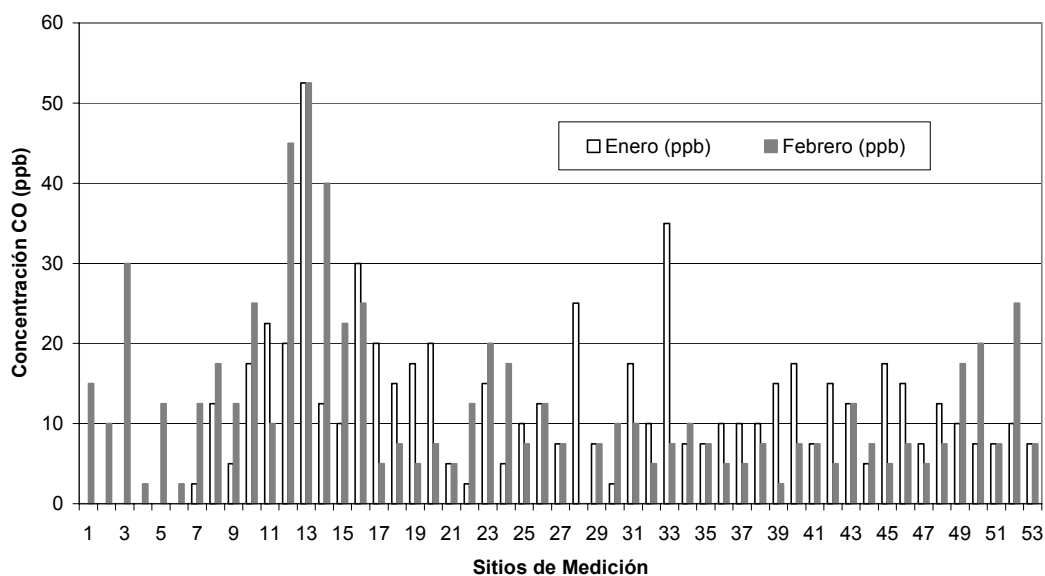
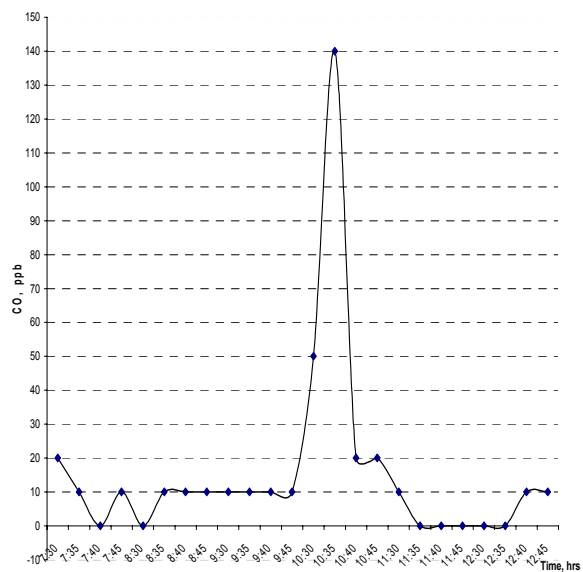
Puntos	Latitud	Longitud	Altura (m)	Dirección	Puntos	Latitud	Longitud	Altura (m)	Dirección
1	25,27778	57,64050	75	Colón esq. Pte. Franco	25	25,29613	57,63915	119	Acuña de Figueroa esq. Caballero
2	25,27960	57,64225	70	Colón esq. Oliva	26	25,29804	57,63586	137	Acuña de Figueroa esq. Parapiti
3	25,28197	57,64390	78	Colón esq. Humaita	29	25,28140	57,63914	112	Oliva esq. O'Leary
4	25,28521	57,64622	95	Colón esq. Jejuí	30	25,28324	57,63665	165	Oliva esq. Alberdi
5	25,28740	57,64775	108	Colón esq. C. A. López	31	25,28424	57,63476	157	Cerro Corá esq. Ind. Nacional
6	25,29017	57,64968	109	Colón esq. Francisco Dupuis	32	25,28545	57,63218	101	Cerro Corá esq. Caballero
8	25,27921	57,63807	90	Pte Franco esq. Juan E. O'Leary	33	25,28661	57,62995	98	Cerro Corá esq. Antequera
9	27,28045	57,63610	77	Pte. Franco esq. 14 de Mayo	36	25,28366	57,64094	71	Humaita esq. O'Leary
10	25,28179	57,63416	85	Pte. Franco esq. N. Sra. de la Asunción	37	25,28524	57,63833	90	Humaita esq. Alberdi
11	25,28315	57,63176	85	Dr. Eligio Ayala esq. Iturbe	38	25,28656	57,63628	92	Humaita esq. Ind. Nacional
12	25,28455	57,62889	99	Dr. Eligio Ayala esq. Antequera	39	25,28775	57,63386	118	F. R. Moreno esq. Caballero
14	25,28646	57,62554	96	E.E.U.U esq. Eligio Ayala	40	25,28898	57,63163	107	F. R. Moreno esq. Antequera
15	25,28830	57,62698	109	E.E.U.U esq. Cerro Corá	43	25,28706	57,64319	96	Jejuí esq. J. E. O'Leary
16	25,29069	57,62847	98	E.E.U.U esq. Fulgencio R. Moreno	44	25,28844	57,64058	89	Gral. Ibáñez del Campo esq. Alberdi
17	25,29247	57,62978	110	E.E.U.U esq. Sta María	45	25,28980	57,63834	112	Gral. Ibáñez del Campo esq. Ind. Nacional
18	25,29408	57,63100	138	E.E.U.U esq. Rep. de Colombia	46	25,29120	57,63606	129	Rpca. de Colombia esq. Caballero
19	25,29660	57,63260	143	E.E.U.U esq. Abay	47	25,29241	57,63396	129	Rpca. de Colombia esq. Antequera
20	25,29877	57,63416	144	E.E.U.U esq. Acuña de Figueroa	50	25,28974	57,64476	110	Milano esq. Juan E. O'Leary
22	25,29189	57,64660	105	Francisco Dupois esq. Juan E. O'Leary	51	25,29129	57,64218	119	Milano esq. Alberdi
23	25,29343	57,64384	119	Francisco Dupuis esq. Alberdi	52	25,29244	57,63998	122	Milano esq. Ind. Nacional
24	25,29469	57,64161	115	Francisco Dupuis esq. Ind. Nacional	53	25,29401	57,63751	143	Abay esq. Caballero
					54	25,29520	57,63546	137	Abay esq. Antequera

Table 1. Reference of the sites of measurement.

## RESULTS AND DISCUSSION.

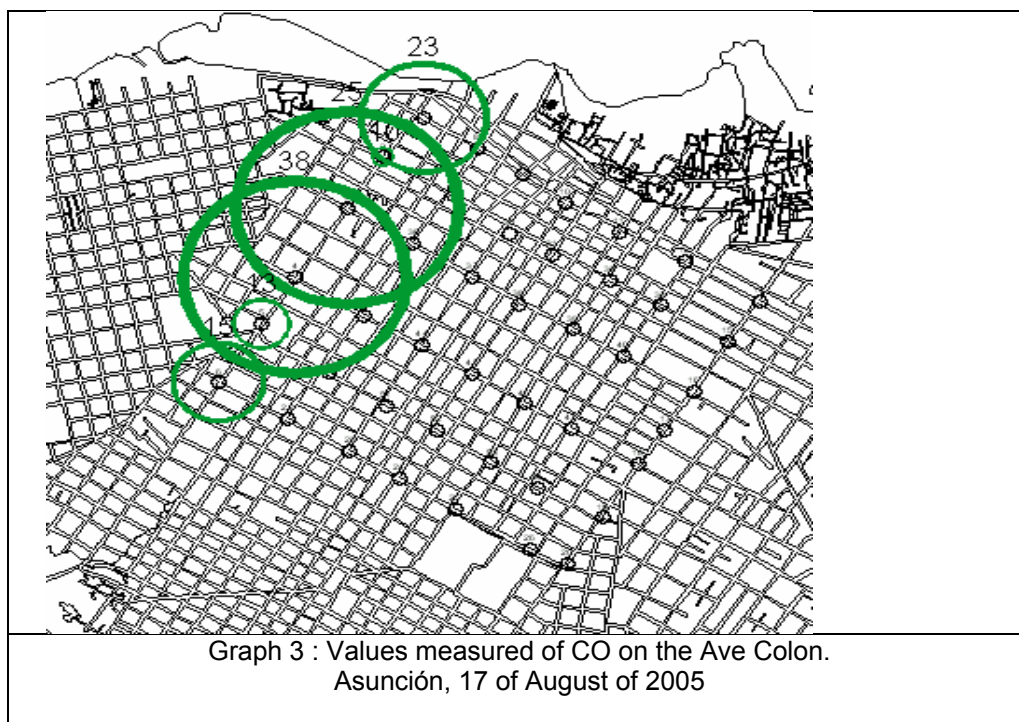
Although the data base made with the measured values of the carbon monoxide in the atmosphere is not of long data in the time, they are first and of recent measurements in the environs of the Micro Center of Asuncio'n, they can help to have an idea of the values and its behavior in a zone that this put under intense and constant I deal of automotive.

Graph 1: Variation of CO during the course of day, Mar 7, 2006, Ave. Olive with 14 of May, shown against Time.



Graph 2: Levels of Carbon Monoxide in the Center of Asunción; January and February of 2006.





Graph 1, shows the daily behavior of the levels of concentration of CO in function of horas. Mar 7, 2006, Av. Oliva with 14 of May, shown against time. The production of the CO is mainly of antropogénico origin, are produced by the emissions vehiculares. The atmospheric processes such as the movement of the air (wind) and the heat interchange (for example, the convection and the radiation) determine the destiny of the polluting agents as they happen through the stages of transport, dispersion, transformation and removal, showing greater levels in the mid-morning.

In Graph 2 are the values measured of the carbon monoxide levels in diferent site of Center of Asunción during January and February of 2006. during the month of February are the greater values of CO, the values is in the North zone of micro center, towards bahia of Asuncion.

The graph 3 show te values in the Colon Ave. of Asuncion, 17 of August of 2005.

## CONCLUSIONS.

The emissions of polluting agents coming from the vehicles of automotive transport of passengers present/display hour variations that respond to the fluctuations of the frequency of circulation of the buses

\* The levels of the carbon monoxide is very variable in micro center, can vary between 2.5 and 70 ppb, depending on the conditions of the time and the form of the automotive traffic by the zone. The level of emission is intense in the rush hours of circulation and depends of the wheatear conditions.

\* Aunque the measured values are not worrisome for the health does not have to let alert themselves of their danger due to their physical characteristics of colorless and odorless.

\* The wind direction has very significant effect in the accumulation and propagation of concentration.

## ACKNOWLEDGEMENTS

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