SULPHUR DIOXIDE (SO_2) AND

TOTAL REDUCED SULPHUR (TRS)

CONCENTRATIONS IN AIR

IN THE SURROUNDING OF GUALEGUAYCHU

AS MEASURED IN THE PERIOD

FEBRUARY 1 2009 – APRIL 30 2009

Measurements of SO_2 and TRS concentrations in air, at ground level, were carried out, as described in our previous report. The place where measurements were obtained was the same as described in our previous report.

Measurements were interrupted only for calibration checking or because of occasional blackouts. Data consistency was reached by means of the method of standard deviation of hourly concentration logarithms.

Relative frequency of wind direction and average velocity for each direction were measured only partially because of problems in the electronic circuit of the data collecting system. However, it can be said that wind velocity and direction was within usual parameters.

In order to have a cogent picture of the obtained values and the impact of the paper mill, it must be taken into consideration that, according to different authorities, the accepted limits for concentration values for SO_2 are those shown in Table 1.

Authority	Average measuring time	Accepted limit (ppb)
Entre Ríos Province	24 hours	19
Buenos Aires City	3 hours	500
	24 hours	140
Buenos Aires Province	3 hours	500
	24 hours	140
U.S.A.	3 hours	500
	24 hours	140
European Union	24 hours	48
World Health Organization	24 hours	8

Table 1: Accepted concentration limits for SO_2 according to different authorities

Regarding TRS concentration it is to be pointed out that TRS is a mixture of different compounds in which sulphur is contained as a sulphide. The worst possible situation would be that in which the only TRS compound is hydrogen sulphide (H_2S). The limits established for H_2S concentration in air by the World Health Organization are shown in Table 2.

	Time average	Concentration limit
Safety limit	24 hours	105 ppb
Smelling detection limit	0.5 hour	0.14 – 1.4 ppb
Smelling identification limit	0.5 hour	0.42 – 4.2 ppb

Table 2: Safety and comfort limits for H_2S concentration according to WHO

The obtained data went through the usual statistical analysis for consistency and, finally, 1689 hourly concentration data were used in our calculations. Statistical parameters corresponding to the data for SO_2 concentration are listed in Table 3 and those for TRS are shown in Table 4.

Number of consistent data	798
Average concentration	0.17 ppb
Maximum observed value	0.45 ppb
Minimum observed value	0.0 ppb
Standard deviation	0.051 ppb
Median	0.102 ppb
Asymmetry coefficient	0.51824
Skew coefficient	0.625936

Table 3: Statistical parameters for SO_2 concentration data averaged over 1 h after consistency analysis

Number of consistent data	798
Average concentration	1.14 ppb
Maximum observed value	2.02 ppb
Minimum observed value	0.37 ppb
Standard deviation	0.298 ppb
Median	1.11 ppb
Asymmetry coefficient	0.593847
Skew coefficient	0.3298415

Table 4: Statistical parameters for TRS concentration data averaged over 1 h after consistency analysis

When averaged over 24 hours the obtained values, after consistency analyses were those shown in Tables 5 and 6.

Number of consistent data	34
Average concentration	0.157 ppb
Maximum observed value	0.222 ppb
Minimum observed value	0.089 ppb
Standard deviation	0.071 ppb
Median	0.149 ppb
Asymmetry coefficient	-0.24012
Skew coefficient	-0.41020

Table 5: Statistical parameters for SO_2 concentration data averaged over 24 h after consistency analysis

Number of consistent data	34
Average concentration	1.112 ppb
Maximum observed value	1.425 ppb
Minimum observed value	0.597 ppb
Standard deviation	0.181 ppb
Median	1.112 ppb
Asymmetry coefficient	-0.16583
Skew coefficient	-0.29341

Table 6: Statistical parameters for TRS concentration data averaged over 24 h after consistency analysis

Figures 3 – 4 show the frequency distribution of SO_2 and TRS concentration values averaged over 1 hour and 24 hours.

The obtained results indicate that the limit values recommended by different authorities have not been exceeded during the observation period reported here.

F I G U R A S

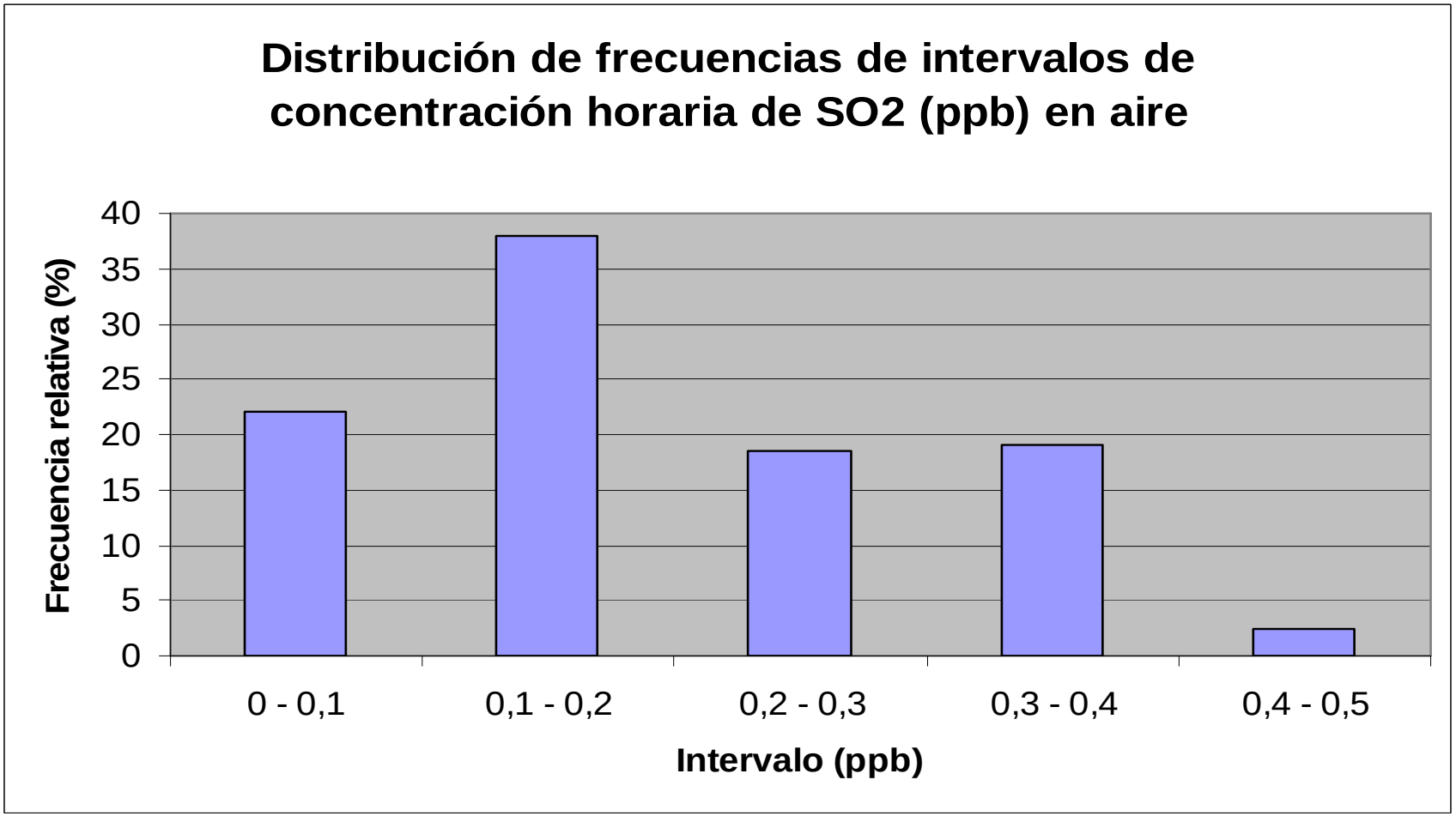
Distribución de frecuencias de intervalos de concentración horaria de SO2 (ppb) en aire
Frecuencia relativa (%)
40
35
30
25
20
15
10
5
0
0 - 0,1
0,1 - 0,2
0,2 - 0,3
0,3 - 0,4
0,4 - 0,5
Intervalo (ppb)

Figure 1

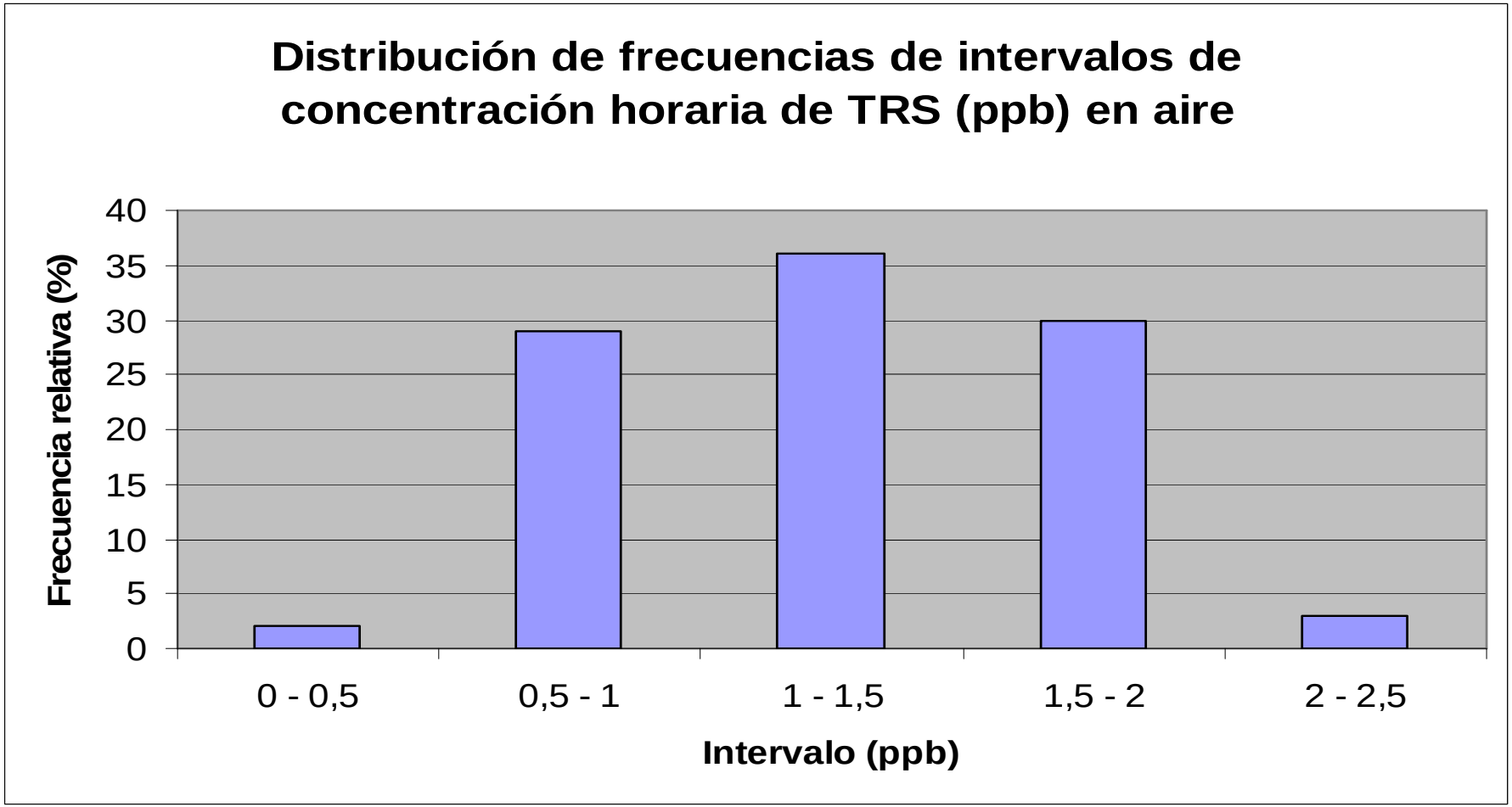
Distribución de frecuencias de intervalos de concentración horaria de TRS (ppb) en aire
Frecuencia relativa (%)
40
35
30
25
20
15
10
5
0
0 - 0,5
0,5 - 1
1 - 1,5
1,5 - 2
2 - 2,5
Intervalo (ppb)

Figure 2

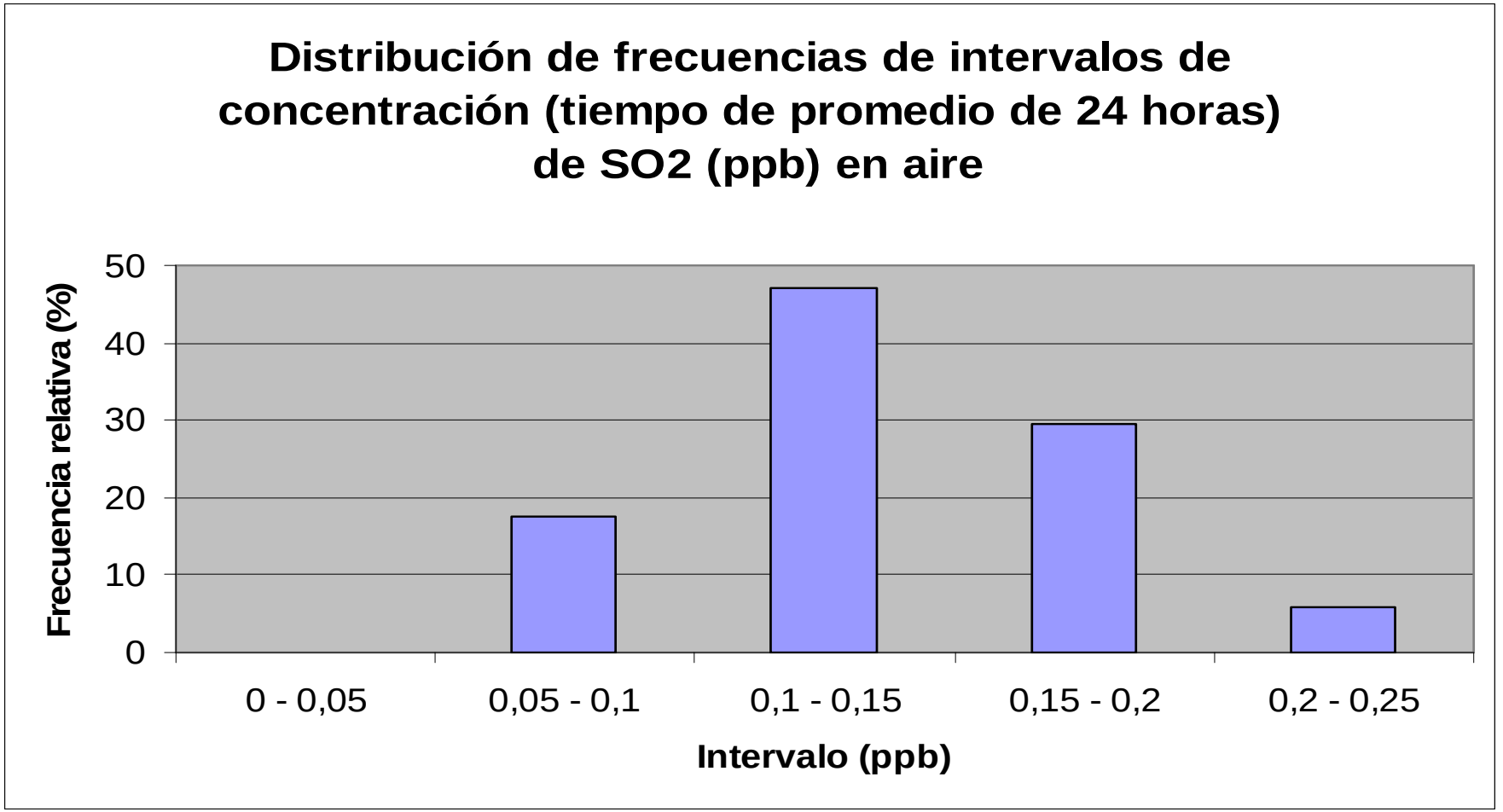
Distribución de frecuencias de intervalos de concentración (tiempo de promedio de 24 horas) de SO2 (ppb) en aire
Frecuencia relativa (%)
50
40
30
20
10
0
0 - 0,05
0,05 - 0,1
0,1 - 0,15
0,15 - 0,2
0,2 - 0,25
Intervalo (ppb)

Figure 3

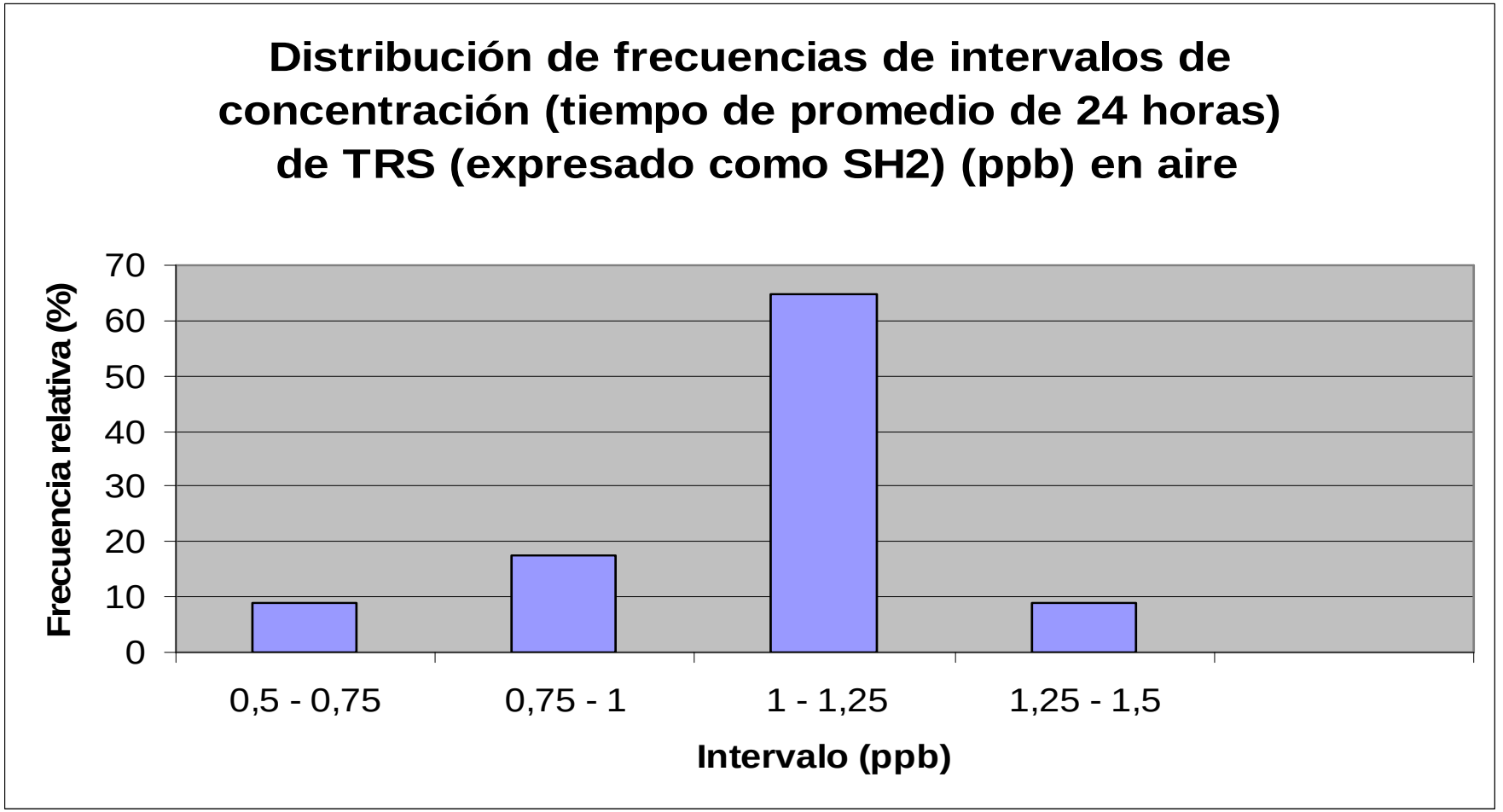
Distribución de frecuencias de intervalos de concentración (tiempo de promedio de 24 horas) de TRS (expresado como SH2) (ppb) en aire
Frecuencia relativa (%)
70
60
50
40
30
20
10
0
0,5 - 0,75
0,75 - 1
1 - 1,25
1,25 - 1,5
Intervalo (ppb)

Figure 4