COMPARATIVE STUDY REGARDING AIR POLLUTION WITH SULPHUR DIOXIDE IN TG-JIU –ROVINARI-TURCENI AREA FROM GORJ COUNTY

Camelia Căpăţînă
„Constantin Brâncuşi“ University of Tg-Jiu, Faculty of Engineering, 3, Geneva Street, Tg-Jiu 210135, Gorj, Romania;
E-mail: camelia_capatina@yahoo.com

Abstract
Multiple activities of human kind had an impact on the energy and chemical balance of the atmosphere. The most alarming manifestations of human activity that had an impact on the evolution of the atmosphere are: acid deposition, urban pollution , evolution of tropospheric ozone and the influence of greenhouse gas concentration. In this paper presents the comparative study regarding air pollution with sulphur dioxide in TG-JIU,ROVINARI and TURCENI area from GORJ county. The monitoring of the sulphur dioxide concentrations in the environmental air was made by means of automatic stations placed in Tg-Jiu , Rovinari and Turceni from Gorj whitch belong to Environmental Protection Agency Gorj in year 2013. The sulphur dioxide analyser of the automatic stations is based on the principle of the classic spectroscopy of fluorescence.The interpretation of the results regarding the sulphur dioxide concentrations in the air was made according to the stipulations of Law no 104/2011 regarding the quality of the environmental air. Analyzing the sulphur dioxide concentrations in the three areas it is reported that the highest values of daily averages were recorded in the months belonging during the cold season, from January to February and / or November to December. Comparing values obtained for sulphur dioxide during period that belongs to the cold season, the highest concentrations were recorded in the Rovinari, where the highest monthly average was 40.3% of the permissible limit, while the lowest was in the Tg -Jiu where the highest monthly average was 28.4% of the limit.The highest sulphur dioxide concentrations were recorded during this period because of the manufacture of coal-based electricity from the Rovinari and Turceni areas, residential heating also is a factor.

Keywords:pollution,air, sulphur dioxide, environmental,coal

Submitted: 01.09.2014 Reviewed: 06.11.2014 Accepted: 26.11.2014

1. INTRODUCTION

The pollution of the environment represents a huge threat to the planet and it has reached a point where it has begun to affect the lives of humans and their habitats.By pasing the limits of nature’s defence , the agents of polution have begun to spread in the air ,water and earth causing one of the bigest threats that humanity must face. Globally, only a third of the sulphur penetrating the atmosphere is produced by the human activities; two-thirds sulphur dioxide or sulphured hydrogen are produced by natural sources.
The majority of the quantity of sulphur dioxide is produced by volcanoes and by the oxidation of sulphur gases, resulting from the decomposition of plants.
Natural fires are another source of pollution of the thermosphere with ashes and gases. These occur when the humidity decreases below the natural climate threshold. The phenomenon is particularly widespread, especially in the tropical zone,altough the degree of humidity of the forests in this area is not likely to provoke the outbreak of a fire.
The main anthropogenic source of sulphur dioxide is burning coal, a solid which, depending on the geographical area where it is mined, contains between 1% and 9% sulf.
In many countries, the predominant use of coal is aimed at producing electricity and heat.(Bica,2000;Blaj et al,1995;Caluianu et al, 1999)
Sulphur is found up to a few percent in crude oil, but it is reduced to the level of just a few hundred ppm in products like gasoline.
Sulphur dioxide is emitted directly into the air as sulphur dioxide, or indirectly as hydrogen sulfide, by the oil industry, when it refines oil and cleanses natural gas before delivery. Another source of pollution is the transport. A special case is represented by the diesel engines that produces significant amounts of sulphur

dioxide gas (sulphur in the diesel), oxides of nitrogen.
Household activities represent another source of pollution. Today, in many countries firewood has become as vital as food, given that we are witnessing a drastic reduction in forest areas. but for domestic purposes not only burns wood but also enormous amounts of coal, oil and natural gas, which results in a variety of pollutants. The sources of pollution with sulphur dioxide in the Tg-Jiu are industrial activities, as well as domestic activities from the surroundings areas.
The main sources of pollution by sulphur dioxide from Rovinari and Turceni from Gorj are the Power-station Rovinari, Power-station Turceni coal mining and household activities.
The study of air pollution in Tg-Jiu, Rovinari si Turceni area from Gorj county constituted the subject of numerous scientific articles .(*Căpăţînă* et al, 2013**;** Căpăţînă et al,2012; Căpăţînă et al;2008; Căpăţînă et al 2013; Căpăţînă et al,2013**).**This paper presents the comparative study of air pollution with SO2 in Tg-Jiu, Rovinari and Turceni.

2. MATERIALS AND METHODS

The monitoring of the sulphur dioxide concentrations in the environmental air was made by means of some automatic stations, placed in Tg-Jiu , Rovinari and Turceni area from Gorj county. For monitoring the quality of air in Tg-Jiu ,the automatic stations is situated in the north-west part of the city. The automatic station of monitoring air quality in Rovinari is situated in the south-est part of the city. The automatic station of monitoring the air quality in Turceni is situated in the north-west from the power-station.
The automatic station for monitoring the air quality is built for being able to work continuously according to the following planning:
• The air is sampled by means of a well and the samples are introduced into each analyser by means of a distribuitor; • The values measured by the analysers and by the entire equipment are purchased and stocked in the purchasing system installed in the station; • These data are shown on the outside informing panel; • Periodically, the accumulated data are transmitted to the system for collecting the distance data, which is supposed to supervise and control the monitoring network of air quality.
The sulphur dioxide analyser is based on the principle of the classic spectroscopy of fluorescence.The sulphur dioxide presents a strong absorption spectrum in ultraviolet between 200 and 240 nm. The actual analyser is composed of a supplying module/ microproccesor containing the energy source,the tension regulators and the system microproccesor and the sensor module containing all the components necessary for measuring the sulphur dioxide.

3. RESULTS AND DISCUSSION

The interpretation of the results regarding the sulphur dioxide concentrantions in the air was made according to the stipulations of Law no 104/2011 regarding the quality of the environmental air.(LawNo104/2011)
For the sulphur dioxide, the limit value admitted in the environmental air for the human health is 125µg/m3,as a daily average.
The values of a daily average concentrations in 2013 Tg.- Jiu are presented in table 1.
From a total of 364 daily average recorded in the year 2013, only one exceeded the admitted limit value, representing a frequency of exceedances of 0.3%.
This was recorded in october as presented in figure 1 and was by 37.2% higher than the admitted limit value.
If we consider monthly average values of 2013, it appears that the highest concentrations of sulphur dioxide was recorded during November, when the monthly average was about 13.4% of the admitted limit. Values close of this period were also recorded in January and June.

Table 1 Daily average concentrations of SO_2 in Tg- Jiu year 2013. (µg/m^3).

Day	Month											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	11,0	14,0	25,4	6,5	20,0	16,1	6,5	6,3	6,4	5,5	9,9	5,1
2	9,9	12,7	20,3	30,7	13,8	30,4	11,9	20,6	6,1	22,5	10,5	5,2
3	8,1	14,8	13,3	7,2	8,0	8,8	10,5	6,1	17,3	7,9	9,0	6,8
4	8,8	23,9	10,4	9,2	7,1	9,1	7,2	5,4	11,0	6,6	10,6	6,7
5	8,9	16,1	6,5	8,5	7,3	9,9	9,3	7,7	17,3	5,4	15,2	7,4
6	9,2	15,3	7,2	5,7	6,3	18,8	5,5	5,2	9,3	4,1	98,9	14,8
7	8,8	11,8	10,4	13,9	6,7	32,5	5,8	8,5	22,1	5,8	45,1	10,6
8	8,6	24,8	7,8	17,9	13,5	46,6	5,2	7,0	22,2	8,6	19,0	9,7
9	8,7	15,1	7,4	10,0	9,3	29,5	5,7	13,9	7,7	5,1	12,2	14,2
10	9,0	14,8	14,9	16,1	28,6	39,9	5,9	18,6	6,0		9,2	5,9
11	8,3	12,8	8,2	8,6	23,6	27,0	8,1	16,9	6,7	171,5	11,8	10,5
12	11,5	11,2	12,2	11,2	12,7	35,3	7,1	9,2	14,0	18,0	14,8	9,2
13	13,9	14,0	11,8	10,2	6,3	23,2	8,3	5,2	8,6	18,7	41,0	9,4
14	20,2	12,7	8,8	5,4	12,1	11,8	13,6	5,5	8,5	12,2	22,9	6,6
15	17,5	12,7	6,7	5,8	6,0	20,0	34,2	5,9	24,5	25,8	20,3	9,4
16	13,8	12,9	9,2	12,9	5,8	8,8	25,1	7,6	23,0	6,8	12,9	10,4
17	9,4	12,0	14,7	9,5	5,9	16,5	10,8	9,6	33,9	5,5	10,7	13,2
18	10,1	10,8	19,6	10,5	7,6	6,8	12,2	9,6	10,6	5,9	9,3	8,4
19	13,9	12,8	68,4	8,5	7,6	9,6	8,0	23,6	7,5	3,9	14,4	10,3
20	31,5	14,4	59,2	6,3	7,8	6,2	30,6	7,7	7,3	6,6	10,8	11,6
21	51,0	9,1	16,6	7,8	9,1	6,5	19,3	17,2	21,1	5,6	14,2	11,9
22	33,2	15,5	11,1	7,9	7,3	9,3	8,1	13,3	18,5	14,9	8,6	13,6
23	21,1	21,8	8,4	9,9	5,2	8,8	8,0	12,6	10,1	10,5	6,2	9,9
24	15,8	16,4	8,3	7,2	7,7	8,5	8,1	37,5	6,2	29,7	6,2	7,6
25	14,4	15,6	9,2	8,4	6,9	9,6	9,2	8,9	6,7	10,3	22,7	7,4
26	19,3	9,7	10,0	6,6	12,2	7,1	6,2	10,4	5,1	23,1	8,9	7,1
27	15,3	6,8	8,9	11,3	9,8	6,6	6,0	60,7	11,7	7,9	7,0	6,9
28	12,0	6,9	7,1	20,7	7,6	8,5	4,9	26,7	7,0	9,2	6,2	6,5
29	20,1		6,5	48,8	8,3	7,6	11,2	8,3	8,5	7,9	6,3	7,4
30	18,2		15,8	29,3	23,0	7,0	7,4	6,7	6,3	15,2	5,0	9,2
31	14,5		14,0		10,1		6,3	6,3		9,3		9,6

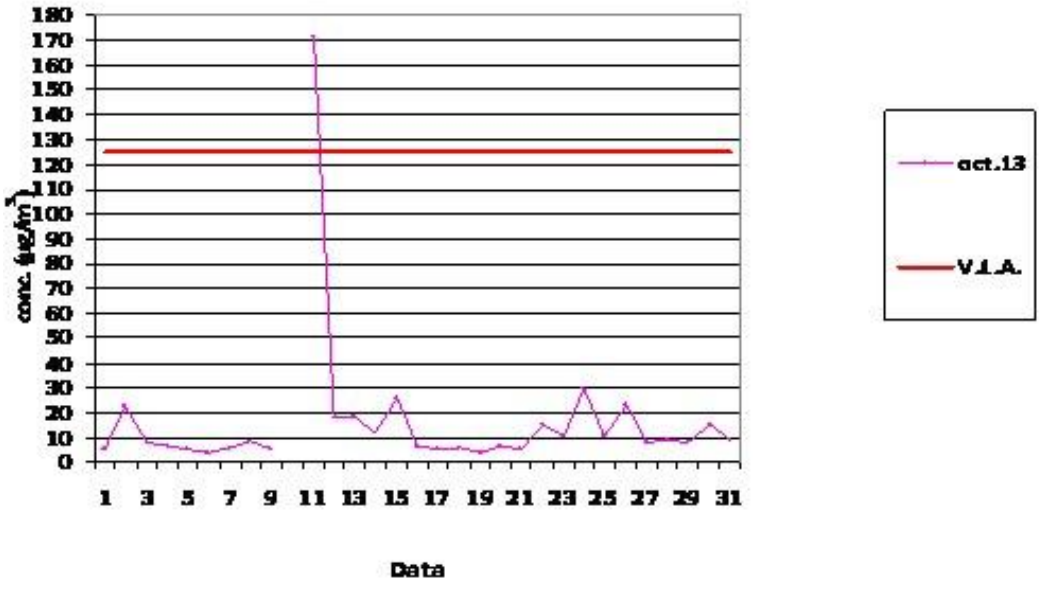

Fig. 1 Variation of SO_2 concentrations in October 2013in Tg-Jiu

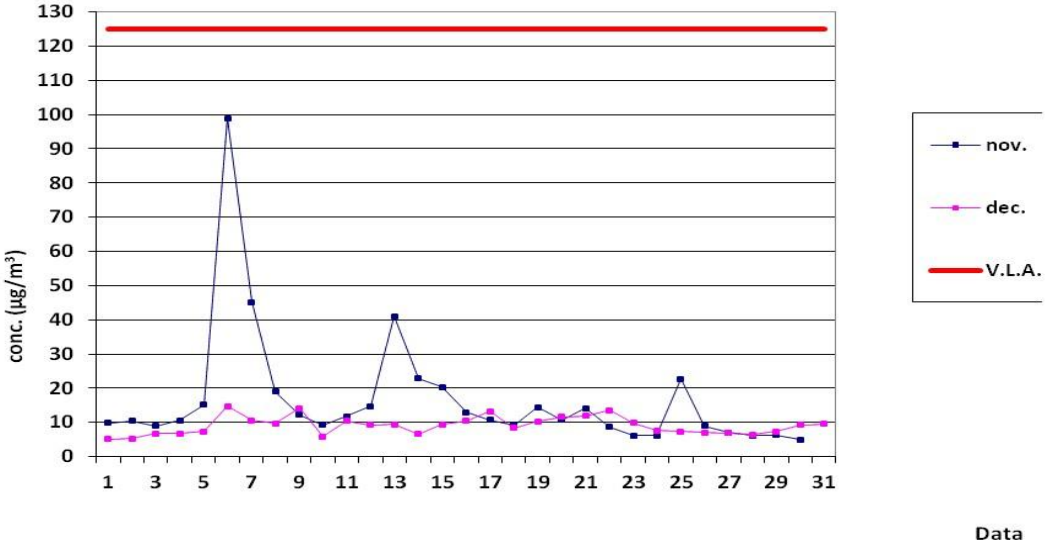

Fig. 2. Variation of SO_2 concentrations in November and December 2013,in Tg-Jiu

Table 2 Daily average concentrantions of So2 in Ronvinari year 2013 (µg/m$^{3)}$

Day	Month											
	I	F	M	A	M	I	I	A	S	O	N	D
1	19,9	28,9	25,6	21,2	18,5	12,5	6,8	14,9	28,0	10,6		
2	15,8	19,4	23,6	21,2	25,3	21,4	7,3	8,7	24,4	24,7		
3	9,8	24,7	21,8	18,5	18,8	11,6	9,7	7,7	53,2	11,8		
4	13,9	34,9	17,1	16,1	15,3	12,8	11,5	7,2	18,0	9,7		
5	13,8	28,8	10,5	20,5	15,0	13,3	15,2	8,9	19,1	7,2		
6	12,8	26,0	15,3	11,8	11,7	12,9	38,0	7,3	22,9	6,6		
7	15,8	22,8	25,0	34,4	13,7	18,1	11,3	8,9	38,8	5,7		
8	14,4	25,3	12,7	22,9	12,3	11,9	10,6	12,6	37,3	43,6		
9	30,5	40,2	18,4	25,6	17,5	29,8	10,6	22,1	12,9	13,8		
10	18,8	39,3	31,2	19,9	11,4	12,3	45,3	15,0	7,4	14,6		
11	19,5	20,8	13,8	12,6	14,5	7,5	18,3	12,3	8,1	56,3		
12	19,5	27,4	18,3	12,0	21,6	6,8	11,6	8,8	16,7	18,8		
13	22,3	30,6	26,0	12,1	11,4	6,3	38,8	6,8	14,0			
14	22,1	30,2	31,9	9,7	10,8	5,2	9,6	6,3	24,8			
15	29,5	26,2	41,1	11,0	8,5	5,2	7,9	10,3	24,5			
16	30,9	24,4	19,4	14,4	8,6	6,0	15,2	7,3	18,5			
17	16,3	24,5	19,4	15,7	11,0	10,8	13,4	7,2	27,6			
18	15,2	21,3	24,6	13,7	11,0	8,5	10,7	31,1	21,5			
19	16,2	19,3	40,8	13,2	14,2	18,7	8,2	41,5	11,8			
20	28,6	31,7	35,7	10,0	20,4	9,4	9,5	20,3	8,8			
21	34,4	20,8	33,5	24,0	21,6	8,5	7,1	23,8	33,7			
22	32,3	31,0	24,3	18,5	29,4	29,8	10,1	14,0	32,4			
23	40,0	48,4	16,5	13,4	11,8	10,7	11,6	36,2	26,1			
24	24,0	46,6	20,4	12,2	12,7	10,3	22,4	21,0	17,9			
25	23,5	37,4	17,8	10,2	15,9	16,5	9,3	17,2	16,4			
26	38,2	21,8	16,8	11,4	11,4	24,0	8,2	31,2	7,9			
27	37,2	13,0	17,2	17,4	13,1	14,7	12,7	56,3	9,7			
28	38,8	18,3	17,1	21,5	22,8	26,9	14,0	21,1	9,0			
29	48,7		19,0	23,4	17,1	7,5	18,4	9,4	27,6			
30	42,5		27,2	13,6	19,0	7,1	11,4	9,7	15,7			
31	32,0		26,3		16,7		10,6	7,8				

At the opposite pole lies December whitch is shown in figure 2 with the lowest concentrations of sulphur dioxide , the average monthly of this period representing 7.3% of the admitted limit.
The average monthly values of the other periods from the year 2013 were between 8.3% and 11,8% of the admitted limit of SO2.
In 2013,the total numbers of the calculated daily average concentrations was 285 ,and there was no overflow during the entire year for Rovinari which is presented in table 2.
The highest concentrations of sulphur dioxide were recorded during February, which is presented in figure 3 when the monthly average was 22.4% of the admitted limit.
During the period of 2013 when the lowest concentration of sulphur dioxide was recorded in the environmental air was June, the monthly average was 10.5% of the admitted limit. During this period, which is presented in fig. 4 the maximum average daily representes 23.8% of the admitted limit.
The lowest daily average during this period represented only 4.1% of the limit. In the remaining periods of the year of sulphur dioxide concentrations presented whose average monthly values were between 11.7% and 20.1% of the admitted limit.
It was found that during 2013 that highest values were recorded in the first two months, the monthly average of the period being highest during the year.
In 2013,the total numbers of the calculated daily average concentrations was 359 ,and for Turceni which is presented in table 3.
Sulphur dioxide concentrations measured during the year varied within very wide limits.
The highest concentrations of sulphur dioxide was measured in February, which is presented in figure 5 the period in whitch was registered and the only limit value has been exceeded.

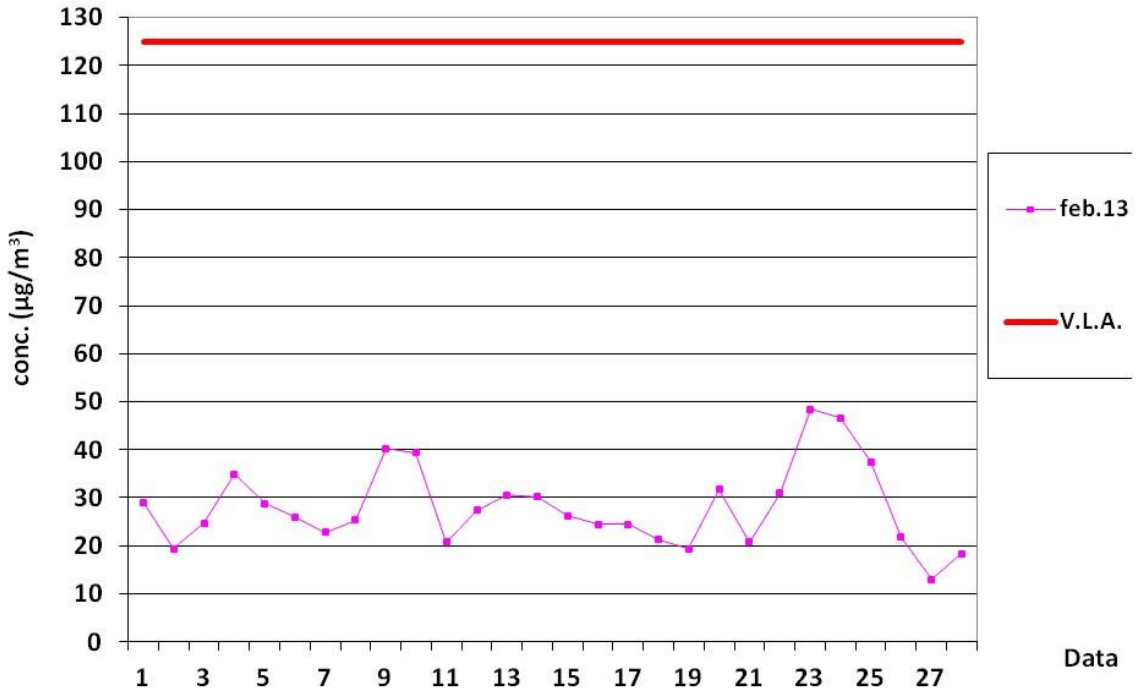

Fig. 3. Variation of SO_2 concentrations in February 2013in Rovinari

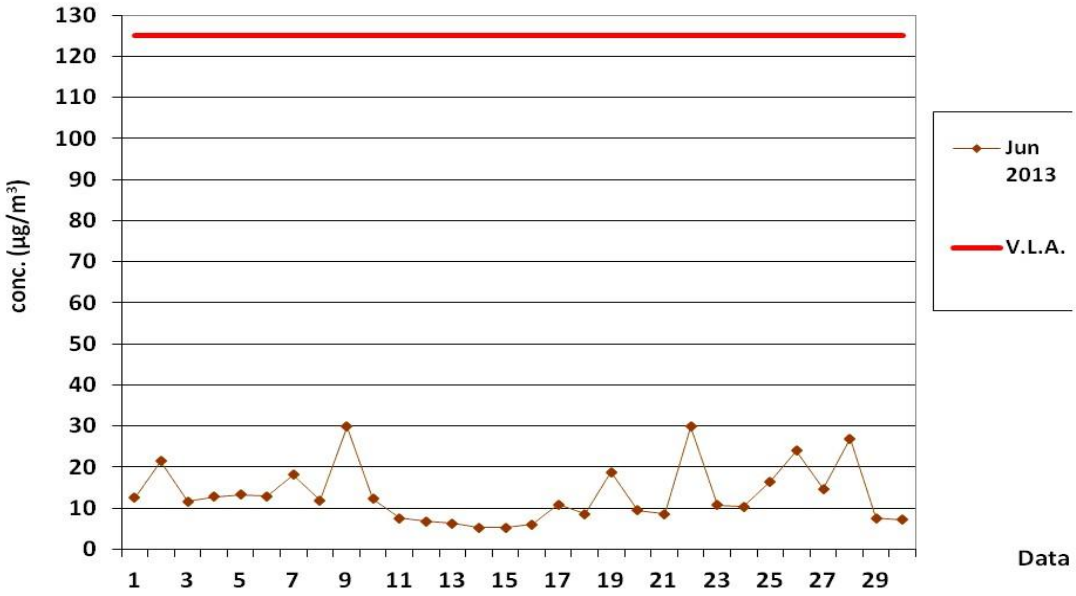

Fig. 4. Variation of SO_2 concentrations in June 2013in Rovinari

Table 3 Daily average concentration of SO_2 in Rovinari year 2013

Day	Month											
	I	F	M	A	M	I	I	A	S	O	N	D
1	11,4	21,3	14,3	8,3	13,4	6,0	8,6	7,0	7,1	16,5	37,3	5,7
2	8,4	21,5	11,3	28,2	13,3	9,3	3,5	6,4	7,9	44,5	12,9	5,6
3	2,4		4,7	5,6	34,0	7,6	9,1	9,8	10,1	10,5	13,1	5,7
4	3,7		5,0	11,6	15,7	14,3	19,5	6,8	10,8	7,6	11,3	7,7
5	9,5	24,4	2,6	4,6	36,3	13,4	9,5	7,1	13,2	6,9	12,2	8,3
6	8,7	12,3		5,0	7,4	12,3	11,8	5,7	25,7	6,1	15,4	39,3
7	6,5	10,4		8,5	8,8	7,6	4,5	12,5	57,5	6,8	10,5	18,9
8	11,1	7,7	4,3	7,8	12,3	7,1	37,7	5,2	34,9	10,5	12,6	11,9
9	8,5	154,3	10,2	9,2	9,6	43,0	4,6	4,6	8,4	14,3	8,5	11,7
10	30,7	57,8	9,0	5,0	9,9	11,0	11,3	10,9	7,5	13,7	5,7	8,0
11	19,4	8,8	6,9	19,2	12,1	5,6	62,3	9,7	7,8	20,1	6,1	15,8
12	19,6	8,1	16,1	6,7	28,2	4,8	15,7	7,8	52,1	115,6	6,0	13,6
13	38,3	25,0	14,9	7,4	9,2	3,3	8,9	10,0	63,1	35,6	7,4	13,2
14	25,3	55,0		4,4	8,3	3,2	5,1	10,8	30,5	11,6	19,1	14,0
15	32,2	16,1		8,5	6,9	3,5	14,1	5,2	31,0	13,0	19,0	12,6
16	12,7	18,7	7,7	13,7	11,4	9,9	7,6	4,5	15,0	9,1	10,7	11,8
17	6,3	14,5	7,7	34,8	10,7	15,2	5,5	2,9	44,7	7,4	6,9	18,8
18	14,6	7,7	15,8	29,4	8,7	4,6	7,3	4,3	17,2	6,9	6,3	18,9
19	35,9	26,9	21,1	7,5	12,5	5,4	4,4	6,3	20,2	6,5	6,0	22,7
20	20,6	11,0	13,0	14,1	13,0	4,8	2,4	8,3	13,6	22,2	7,2	20,4
21	27,6	12,6	18,4	8,5	24,5	10,9	11,4	18,6	53,1	12,6	7,3	20,3
22	23,8	11,0	7,6	7,8	23,1	23,4	5,0	21,1	39,7	46,6	5,8	16,3
23	15,1	19,3	3,9	38,8	16,2	5,7	5,2	52,0	43,2	40,8	5,8	12,6
24	10,8	30,0	17,0	10,8	8,3	7,0	5,4	81,7	27,3	32,0	16,7	11,1
25	12,5	18,0	4,9	9,5	11,0	7,5	5,3	17,6	8,6	22,3	26,0	11,0
26	54,5	9,8	7,1	8,9	9,4	5,8	5,6	17,9	7,4	24,0	14,5	15,0
27	55,1	4,2	22,1	18,0	11,0	11,8	8,4	74,0	8,8	12,0	12,7	7,4
28	86,1	19,8	13,7	30,8	13,5	14,8	8,3	25,3	17,6	13,4	8,6	15,1
29	64,9		8,1	15,3	23,3	9,5	9,7	10,8	24,1	11,7	8,7	12,9
30	20,3		19,3	11,5	12,8	30,1	20,2	6,5	6,1	32,0	16,3	18,1
31	31,2		21,7		13,8		10,4	2,2		32,3		21,0

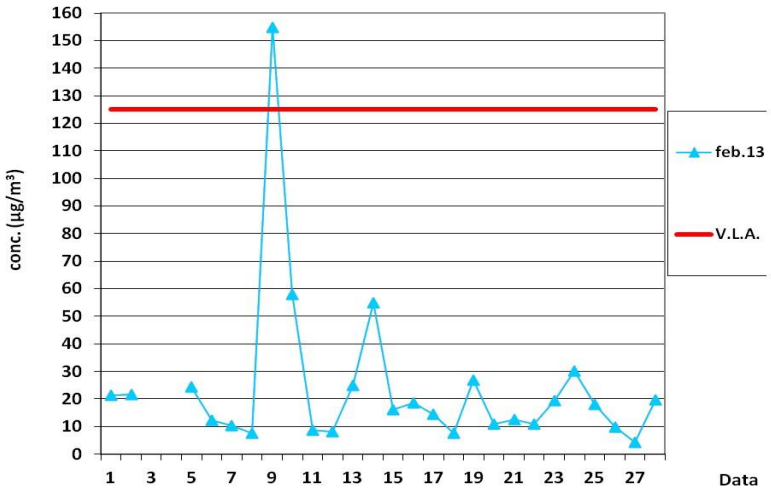

Fig. 5. Variation of SO_2 concentrations in February 2013 inTurceni

Highest daily average concentration during February was by 23.4% higher than the admitted limit, while the lowest was by 96.6% below this limit.

Other daily average during February were between 6.1% and 46% of the allowable limit.

At the opposite pole came June during which was recorded the lowest concentrations of sulphur dioxide in 2013, the monthly average being about 8.5% of the limit.

Highest daily average concentration of this period represented 34.4% of the allowed limit, and the lowest only 2.5%.

Taking into account the fact that each of the studied three areas there is one automatic air quality monitoring station, and that these stations are equipped with the same type of equipment for each monitored indicator (SO2, NOx, O3, CO and PM10), based on measurements made during 2013 there can be made a comparison between air quality in these areas in terms of sulphur dioxide pollution.

If we compare the actual number of days when the measurements were performed on concentrations of sulphur dioxide to the total number of calendar days in the year of study, it is found that for the Târgu Jiu is 84%, for Rovinari is 66% and for the Turceni 78%.

The lowest number of exceedances was recorded in the Târgu Jiu, representing 0.1% of all measurements made during 2013.

Analyzing the sulphur dioxide concentrations in the three areas it is reported that the highest values of daily averages were recorded in the months belonging during the cold season, from January to February and / or November to December.

Comparing values obtained for sulphur dioxide during period that belongs to the cold season, the highest concentrations were recorded in the Rovinari, where the highest monthly average was 40.3% of the admitted limit, while the lowest was in the Tg -Jiu where the highest monthly average was 28.4% of the limit.

The highest sulphur dioxide concentrations were recorded during this period because of the manufacture of coal-based electricity from the Rovinari and Turceni areas, residential heating also is a factor.

The corresponding specific index of sulphur dioxide shall be determined by classification of hourly mean value of concentration in one of the areas listed in Table 4

The prerequisite for establishing the general air quality index is the existence of at least three values of the monitored indicators.

Table 4 The corresponding specific index of SO_2

The field of concentration (µg SO_2/m^3)	Specific Index
0 – 49,9	1(excelent)
50 – 74,9	2 (very good)
75 – 124,9	3 (good)
125 – 349,9	4 (medium)
350 – 499,9	5 (bad)
>500	6 (very bad)

A first observation is that, regardless of the area monitored, from the six specific quality indices, prevailed the quality index excellent(1).

From the general indices of air quality set based on the values of specific indices for sulphur dioxide, that shows in the figure 6 the highest percentage had general index 3 (good) and 4 (medium), which accounted for 36% and 54,6% from the total of general indexes Specific index 6 (very bad) has contributed only 1.2% to establish the general indicators of air quality for the Tg-Jiu, which was registered in 2013.

For Rovinari the total number of general indicators of air quality indices determined on account of values specific indexes for sulphur dioxide it was much more bigger as shown in figure no 7. And this time prevailed General indices 3 (good) and 4 (medium), which accounted for 33.3% and respectively 47,7% of the total take was much higher.

Unlike the Tg. -Jiu, Specific index 6 (very bad) contributed most to the establashing of the general air quality indices, representing 5.2% of determining indices of total expense values for sulphur dioxide.

And in the Turceni, the values of the specific indexes for sulphur dioxide has contributed to a greater extent than in Târgu Jiu in determining the general indices of air quality.

The larger contribution had a specific index 2 (very good), 3 (good) and 4 (medium), the latter representing 24%, 29,3% and 40% respectively of the total set indices based on the values for sulphur dioxide as it shows in figure 8.

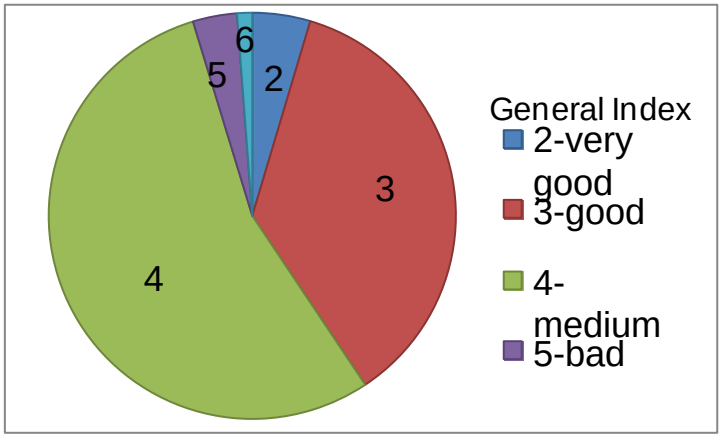

Fig. 6. Distribution of general indicators of air quality determined of SO_2 in Tg. Jiu

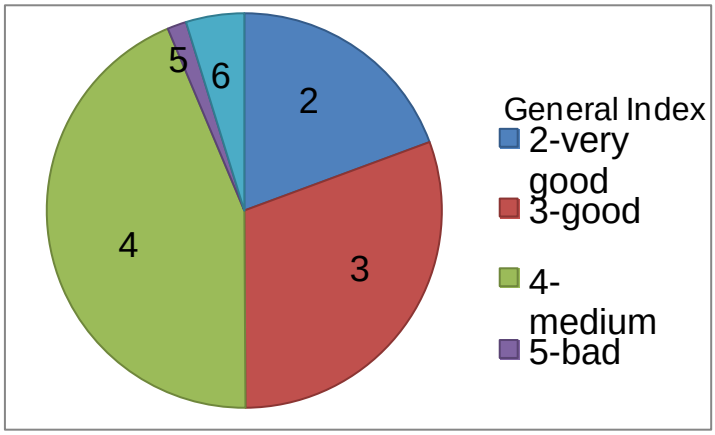

Fig. 7. Distribution of general indicators of air quality determined of SO_2 in Rovinari

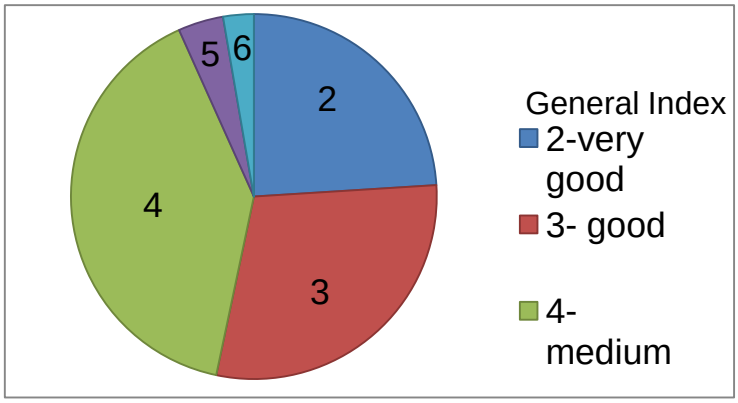

Fig. 8. Distribution of general indicators of air quality determined of SO_2 in Turceni

In the area of Turceni general index 2 (very good) has registered a significant increase, both towards Rovinari , but especially towards Tg - Jiu.

The general index 6 (very bad) was present in lower numbers than in Rovinari, but higher than Tg -Jiu.

At present the methods used to reduce emissions of sulfur dioxide from the flue gas desulphurization and most widely used of these is the method of wet desulphurization. (H.G440/2010;Order833/2005)This method of reducing the amount of sulphur in the flue gas is used by the two power plants, Rovinari and Turceni. In this sense the two thermal power units have developed programs to reduce emissions of sulphur dioxide, nitrogen oxides and dust.

4. CONCLUSION

In light of the results on air pollution by sulphur dioxide in the three areas analyzed and the measures used to reduce pollution , the folowing conclusions can be drawn.:

- Sources of sulphur dioxide pollution are mainly Rovinari and Turceni power plants, industrial activities and road traffic in Târgu Jiu and household activities by domestic heating with different fuels in the winter.
- As a general observation is that the highest concentrations of sulphur dioxide in the three areas were recorded in the months belonging to the cold season, from November to December and / or January-February.
- Of the three areas analyzed, higher concentrations of sulphur dioxide were recorded in the Rovinari, where the highest concentration monthly average was 40.3% of the allowable limit, which is in November 2013 followed by the Turceni monthly average of 32% of the allowed limit, all recorded in November 2013 and then Târgu Jiu 28.4 of the admitted limit , registered in January 2013.
- The lowest concentrations of sulphur dioxide were recorded in all areas during April-September.
- In the Târgu Jiu was recorded only one exceeded admitted limit value, in 2013 October, and was by 37.2% higher than the admitted limit.
- In the Rovinari four exceedances were recorded, all in the year 2013.The highest daily average concentration was by 79.3% higher than the admitted limit and the lowest 6%.
- In the Turceni number of exceedances was three, one in 2013 and was by 23.4% higher than the admitted limit and two in 2013, which were by 35% and 100.4% higher than the admitted value.
- Among the general air quality indices established only on specific indexes values for sulphur dioxide, the highest percentage in the general index was 3 (good) and 4 (medium), Tg- Jiu and Rovinari and 2 (very good), 3 (good) and 4 (medium) for the Turceni. .In the Turceni number of exceedances was three, one in 2013 and was by 23.4% higher than the admitted limit and two 2013 which were located with 35% and 100.4% above the limit.

- Power plants Rovinari and Turceni have ongoing programs for the progressive reduction of sulphur dioxide emissions to achieve the emission limit values set by the regulations in force

5. REFERENCES

[1] Bica I, Elements of impact over the environment, MATRIX ROM Publising House, Bucharest, 2000
[2] Blaj A., Ionescu C.,Environmental impact of pit coal extractive industry, Mines Magazine,1995
[3] Caluianu S, CociorvaS., The measurement and control of the atmosphere pollution, MATRIX ROM Publising House, Bucharest,1999.
[4] 4.C. Căpăţînă, C.M. Simonescu-*The current state of PM10 air pollution in the area of influence of the Rovinari Thermal power plant*,Revista de Chimie, 64(12), 2013,p1471-1476, ISSN 0034-7752.
[5] C. Căpăţînă, C.M. Simonescu – *COMPARATIVE STUDY ON AIR POLLUTION BY PM10 IN AREA TARGU-JIU-ROVINARI -TURCENI*, Revista de Chimie, 63(12), 2012, p1289-1295, ISSN 0034-7752
[6] C. Căpăţînă, C.M. Simonescu – *Studies on air pollution with air – floated powders and lead in Tg-Jiu City*, Gorj County, Environmental Engineering and Management Journal,.7, 2008, p. 125-128, ISSN 1582-9596.
[7] C. Căpăţînă, Gh. Gămăneci -*Studies regarding the air pollution with sulphur dioxide in Tg-Jiu municipality*,Annals of the „Constantin Brâncuşi" University of Târgu-Jiu, 3,2013, pg.61 -66,ISSN 1842-4856
[8] C. Căpăţînă, Gh. Gămăneci -*Assessement of heavy metals content in the air in the influence area of Rovinari Thermal power station in GORJ COUNTY*,Annals of the „Constantin Brâncuşi" University of Târgu-Jiu, ,2013, pg.67 -71,ISSN 1842-4856
[9] Law NO 104/2011 on ambient air quality.
[10] H.G. No. 440/2010 establishing measures to limit air emissions of certain pollutants from large combustion plants.
[11] Order no. 833/545/859 of 13 September 2005 approving the National Program to reduce emissions of sulfur dioxide, nitrogen oxides and dust from large combustion plants.