

POLLUTION WITH SEDIMENTARY POWDERS IN CRISUL REPEDE DRAINAGE AREA

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Abstract: The dust, although not toxic, irritates human respiratory apparatus, is harmful for vegetation it penetrates into people's homes, etc. As regards meteorological effects, one mentions the following: it reduces the solar radiation's intensity, it is an incentive factor for mist formation, it alters the thermal regime, and thus it can put its mark on the surface climate of a region. As regards local physical and geographical conditions, we mention that the monitored area has the advantage to be at lower altitudes, with a large opening towards west, which favours a free circulation of air masses which purify the air against the unpleasant effects of dust and industrial smoke. In order to analyse the sedimentary powders in the Crisul Repede drainage area we employed the data provided by the branches of Cluj and Bihor counties of Environment Protection Agency. Both at Bihor County and at Cluj County level, monitoring activities on sedimentary powders are performed on a monthly sampling basis. Thus, the sedimentary powders are being sampled on a low flow regime in 14 sampling and checking points, divided in three areas at the level of Bihor County and one point at the level of Huedin city, with a monthly sampling,

as following: 1st area (county north-west area): Tarian, Biharia, Salard, Episcopia Bihor; 2nd area: Baile 1 Mai (1 Mai Spa), Oradea meteorological station, Environment Protection Agency Oradea; 3rd area: Telechiu, Chistag, Pestera, Alesd, Astileu, Subpiatra, Tetchea Huedin area. We have analysed the samples of powders at the level of three monitoring points in Bihor county deposited for a 15 years' time span, from 1994 to 2008 respectively, and for the Huedin area for a 5 years' time span, from 2004 to 2008 respectively. The collected samples were covered all the months of the year. In order to carry out this research we have used a series of research methods, out of which we mention following: analysis method, deduction method, induction method, comparative method, mathematics-statistics method and graphs and interpolation method. The sanitary standard for sedimentary powders is of 17 g/m²/month and it was outrun only at Huedin sampling point. The high values recorded in this area are due to the fact that Huedin does not have a traffic belt highway for heavy traffic which is guided directly to downtown where the monitoring point is located, as well as due to the Bologa and Poieni neighbourhoods.

Key words: powder, maximum rated value, monitoring points

INTRODUCTION

Dust dissemination into atmosphere is dependant upon local conditions, mainly influenced by physical and geographical factors and, especially, the weather. Among the meteorological conditions conditioning the dust spread we mention, on the first hand, the wind direction and speed at ground level and high altitudes, time and amount of precipitation, as well as temperature distribution at different levels of the atmosphere, which have an impact on the atmosphere stratification and, by this, its steadiness level (MAHARA GH., 1969).

Vegetation is of utmost importance as it is a barrier against dust.

The maximum rated value for powder is of 17 g/m²/month.

MATERIAL AND METHODS

In order to analyse the sedimentary powders in the Crisul Repede drainage area we employed the data provided by the branches of Cluj and Bihor counties of Environment Protection Agency.

The data collected were processed by means of mathematics and statistics methods. The results thus obtained were then translated into graphs in order to highlight clearly the variability in time of the targeted air pollutant.

In order to analyse the air quality, the presence and amounts of toxic elements in the air are taken into consideration, and their comparison with the maximum rated values of concentration, set up by STAS 12574/1987.

RESULTS AND DISCUSSIONS

Annual and multi-annual evolution of powder

While monitoring the evolution of sediments powder within Crisul Repede drainage area, within the assessed time span, one noticed that the highest amount of powders was generated in 2005 at Huedin city collecting point, namely 21.839 g/m^2 , while the lowest amount was recorded in 2000 at 1 Mai Spa, of only $2,545 \text{ g/m}^2$.

Thus, out of the Figure 1 it results that the highest average level of powder was recorded at Huedin city collecting point, namely 18.406 g/m^2 , followed by Astileu with an average level of 7.800 g/m^2 , next by Subpiatra locality with 7.564 g/m^2 , while the lowest average value was recorded at 1 Mai Spa, namely $4,209 \text{ g/m}^2$.

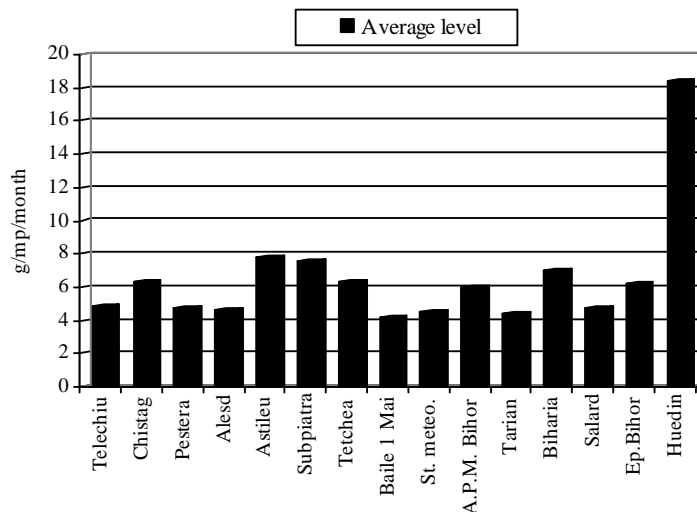


Figure 1: Evolution of multi-annual concentrations of powder in the 15 collecting localities within Crisul Repede drainage area

Monitoring the evolution of powder within 1994 – 2008 time span, the maximum rated value from health norms point of view is of $17 \text{ g/m}^2/\text{month}$ and it was exceeded only at Huedin city collecting point. The high rates in this area are due to the fact that Huedin city does not have a belt highway and the heavy traffic is directed straight through the city downtown where the monitoring point is also located.

Monthly evolution of powder

Out of the monthly evolution of powder levels, throughout the assessed period, the average concentration at the 15 monitoring points has the highest rate (23.279 g/m^2) in July, followed by June (20.036 g/m^2), of the same year 2005. The rates generated during the last five years monitored (2004 - 2008), are due mainly to Huedin city collecting point where high

levels were recorded (monitoring of this point started in 2004). The lowest concentration is generated in August, 1996 and it reaches the level of 1.690 g/m². Following the analysis of the outcomes recorded at the monitoring points the results show that the rate of powder is within maximum rated value of 17 g/m²/lună, with one exception, namely Huedin city collecting point due to the heavy traffic developed through the city downtown where the collecting point is located, and also due to pits of Bologa and Poieni gravel pits.

In the month of June 1995, at the powder monitoring points of Biharia and Tarian, high rates of powders were recorded, a possible explanation being an accidental pollution, as meteorological conditions for June 1995 were normal, and both precipitation and winds were according to standard parameters. As no individual monitoring was performed one may not accurately assess the cause and identify the.

The multi-annual monthly evolution of the average of the 15 monitored localities shows the fact that the month of June has the highest rate of powder with an value of 9.096 g/m², followed by the month of July with a rate of 8.365 g/m², and the month of May with a rate of 8.352 g/m². January is the month showing the lowest rate of powder, of only 3.602 g/m², respectively (see Table 1, Figure 2).

Table 1

The multiannual monthly evolution of powder concentrations within Crisul Repede drainage area (the average of the 15 monitoring points), within 1994 – 2008 time span

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Average	3.602	4.865	5.942	7.266	8.352	9.096	8.365	6.976	7.361	6.381	5.798	4.864

Source: Agency for Environmental Protection – branches of Bihor and Cluj

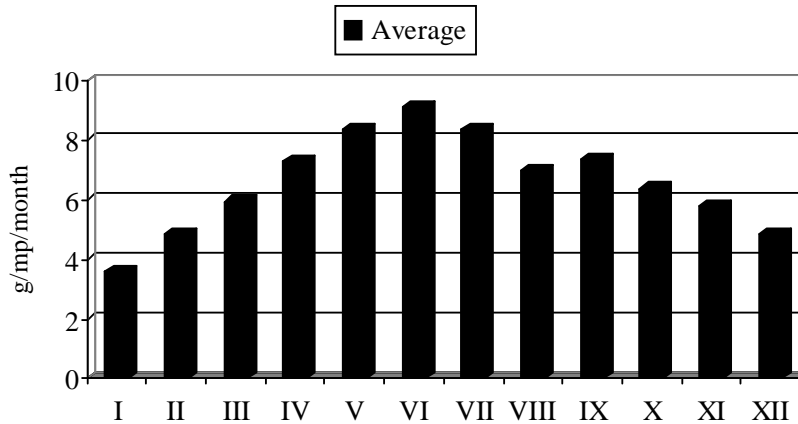


Figure 2: The multiannual monthly evolution of powder concentrations within Crisul Repede drainage area (the average of the 15 monitoring points), within 1994 – 2008 time span

The evolution of powder rates on areas

Throughout the analysed period, within Crisul Repede drainage area, the area with the highest rates of powder concentration is the Huedin city are, reaching the highest rate in 2005, namely of 21.839 g/m² and in 2004 with a rate of 14.973 g/m², followed by the 3rd area with a rate of 6.831 g/m², recorded in 1999. In 1994 the lowest value in this area is of 3.822 g/m².

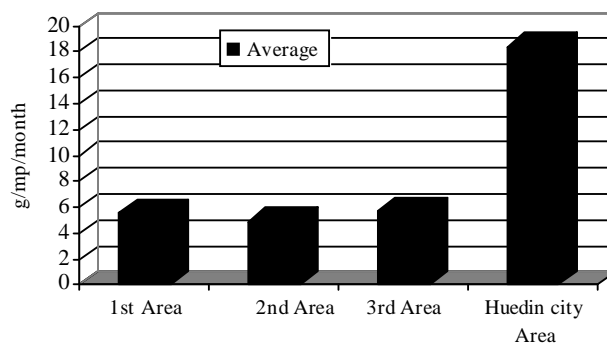


Figure 3: The allocation of multiannual media concentrations of powder on the four areas of Crisul Repede drainage area, within 1994 – 2008 time span

At Astileu, monitoring started in 1997, at Subpiatra and Techea in 1999, while at Huedin city it started in 2004.

In the 2nd area, the year with the highest level of sediments is 1994 with 5.430 g/m², while the lowest rate was recorded in 2000, namely of 3.835 g/m².

In the 1st area, the largest annual rated recorded was in 1995, being of 7.119 g/m², while the lowest value was recorded in 1999, namely of 4.138 g/m². At Episcopia Bihor, the monitoring of powders started in 1998.

While assessing the four areas (the average of the twelve years contained into our research), one may notice that the highest powders concentrations are in Huedin city area, due to both heavy traffic and Bologa and Poieni gravel pits, with a rate of 18.406 g/m²/month, followed by the 3rd Area with a rate of 5.751 g/m²/month (see Figure 3) due to the fact that the most powder polluting sources, namely the industrial polluters companies Holcim, Fibrocim, and Helios companies are located within this area; the third area from the level of polluting rate point of view is the 1st Area with a concentration of powder of 5.575 g/m²/month, this area being located in the proximity of the city industrial area. The 2nd Area has the lowest level of polluting with powder due to the fact that collecting points are located farther than the industrial area (see Figure 3).

CONCLUSIONS

For the assessed time span, the average powder rates within Crisul Repede drainage area exceeded the maximum rated values only at the Huedin city collecting point. The main cause of this exceeding is twofold: the traffic directed through the city centre where the monitoring point is located, and the Bologa and Proieni gravel pits. As regards the remaining areas submitted to monitoring, the maximum rated values were not exceeded.

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