ORIGINAL RESEARCH ARTICLE

Analysis of Heavy Metal Pollution in Urban Surface Soil

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ABSTRACT

The impact of human activities on the quality of urban environment has become increasingly prominent and urban soil pollution problems on the health of local residents also gradually prominent. In addition, the study of heavy metal pollution in urban surface soil is an important part of the evolution model of urban geological environment so it is necessary to analyze the heavy metal pollution in urban soil. In this paper, the data of the given samples are processed and analyzed by MATLAB software and EXCEL spreadsheet. The three - dimensional image model and the planar model of metal element space are established by interpolation method. The spatial distribution of eight kinds of heavy metal elements in the city is presented in detail. For the urban environment, especially the macro-grasp of soil pollution, regulation provides a simple and accurate three-dimensional spatial distribution model of pollutants. Combined with data analysis of the urban area of different areas of heavy metal pollution to make a preliminary judgment. The data show that in the five types of cities, heavy soil pollution is the most serious in industrial areas. A method of imagination of the data analysis is boldly used and then combined with the distribution map, they found a source of pollution. For the spatial distribution of heavy metal elements, this paper uses EXCEL to calculate the data and MATLAB to map the data which showed a detailed and intuitive distribution map according to the distribution map can be analyzed in different areas of pollution; For the second question, this paper uses a method of design to deal with the data, part of the data for the results of the more effective show to determine the cause of pollution. For the third question, this article will be more serious pollution or a wider range of local screening, analysis, and then speculate the location of pollution sources. For other pollution information, this article is based on the modeling process encountered in the thought of the factors given.

KEYWORDS: MATLAB; quadratic interpolation; soil pollution; heavy metal pollution; source speculation

1. Problem restatement

1. The data must be drawn to a more intuitive, the actual distribution map, and then according to the image, combined with data that pollution.

2. Through data analysis, explain the causes of pollution.

3. Combine the first question and the data, use the knowledge to analyze the characteristics of pollution transmission, and then infer the location of the source of pollution.

4. According to the modeling process in the encounter or think of, and then explain the evolution of urban geological environment model, but also what information should be collected, with this information, how to build a model to solve the problem.

2. Abbreviation

Pi ... i's dirt index;

P times ... Pi the second largest value

Ci ... i measured the dirt;

Si ... i the dirt background value;

P ... soil composite index

Pmax ... Pi the maximum;

3. Hypothesis

1. In order to facilitate the visual view of the image, the coordinates of the altitude is not taken into account;

2. In order to simplify the problem, the city's background values are uniformly calculated according to the average of the measured background values;

3. Assuming that there is no river in the city;

4. A data of 0 to 10 cm depth per square kilometer soil as the average standard data in the area;

5. According to the data calculated in this paper, the degree of pollution is divided;

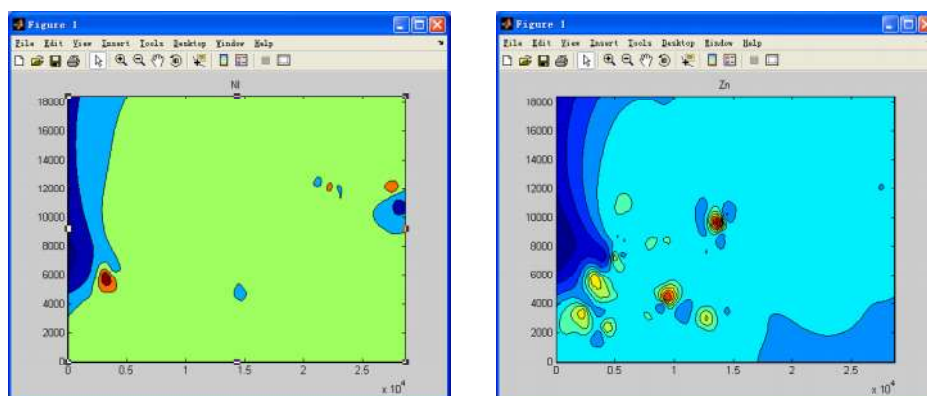6. Ignore mutual pollution in each urban area

4. Model established in the analysis

4.1. Spatial distribution of eight major heavy metal elements in the city
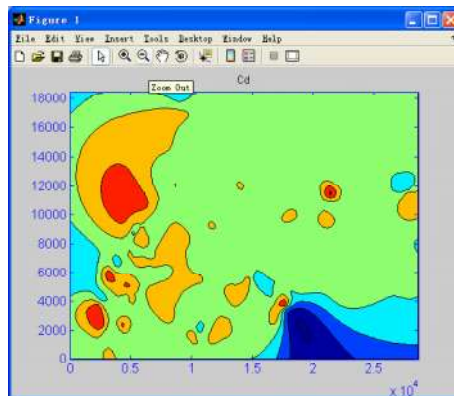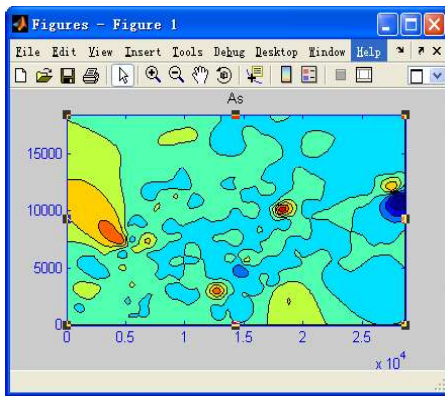
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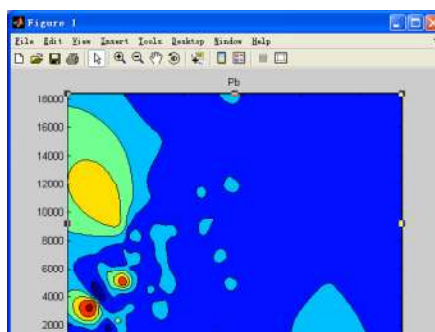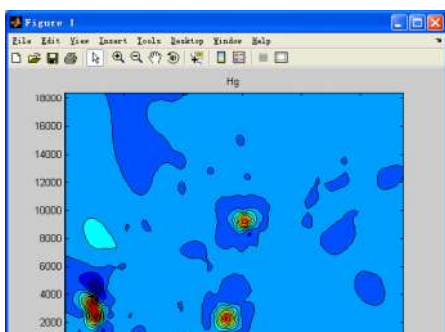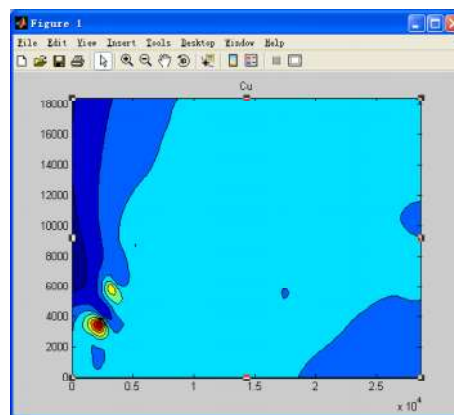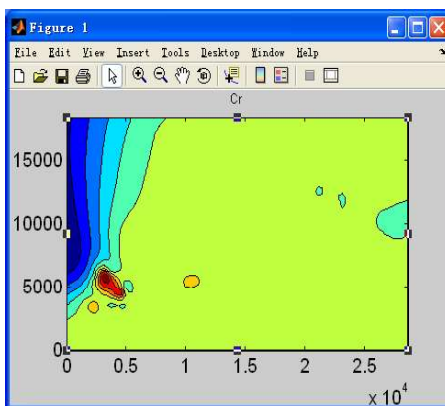
4.2. The degree of pollution of heavy metals in different areas of the city

Environmental pollution is mainly affected by human social activities, the city are divided according to the functional division such as living area, industrial area, mountain, trunk road area and park green area. Different regions affected by the different human, so the degree of pollution of heavy metals.

From two aspects of data processing and analysis: First, consider in a divided area, seeking different levels of pollution of metal elements; Second, the comprehensive consideration of all heavy metal elements in different areas of pollution.

First, the single factor pollution index method is used.

Single factor pollution index calculation formula: $Pi = Ci / Si$

The sample data belonging to the living area are selected from the given samples, and the average measured values of the metal elements are calculated and substituted into the above equation. Find the dirt index of the elements of the living area and to calculate the other four areas of the dirt index, the results are as follows:

Pi	As (μg/g)	Cd (ng/g)	Cr (μg/g)	Cu (μg/g)	Hg (ng/g)	Ni (μg/g)	Pb(μg/g)	Zn (μg/g)
Living area	1.741793	2.30472	2.2264	3.742665	2.658305	1.491242	2.229238	3.434908
Industrial zone	2.014275	3.023932	1.722876	9.661806	18.35301	1.610705	3.001317	4.027935
Moutain zone	1.123359	1.17169	1.256764	1.311915	1.170173	1.256406	1.179223	1.062235
Trafic area	1.585568	2.769342	1.872707	4.713252	12.76636	1.432285	2.04949	3.519636
Park area	1.739921	2.158022	1.407613	2.287251	3.285478	1.243066	1.958341	2.235395

When considering the comprehensive pollution of heavy metal pollution in different areas, the introduction of soil comprehensive index P It is known from the Nemerot pollution index that the method is a consideration that takes into account the effects of single elements and highlights the most serious elements of pollution. The combination of the city's pollution status (that is, each division has two more important elements) are calculated using the formula:

$P = \{(n-1\Sigma Pi) 2 + [(Pmax + P\ times) / 2] 2\} 1/2$

The data into the calculation, Table 2:

Living area	Industrial zone	Moutain zone	Traffic area	Park area
3.080358	10.62214	1.238683	6.749774	2.441104

3

Level	P	Level of pollution	Pollution status
1	0~0.15	Safe	Clean
2	0.15~1.5	Alert	Still clean
3	1.5~3	Mild	Mild pollution
4	3~4.5	Intermediate	Intermediate pollution
5	≥4.5	Severe	Severe pollution

Table 3 shows the classification of soil pollution levels. From the above table we can see that the living area is moderate pollution; industrial areas are heavily polluted; mountain is still clean, close to the cordon. Traffic is also heavily polluted, but lighter than industrial areas. Park green area, more than the background value, are mild pollution. Pollution from heavy to light: industrial areas, traffic areas, living areas, parks, green areas, mountains.
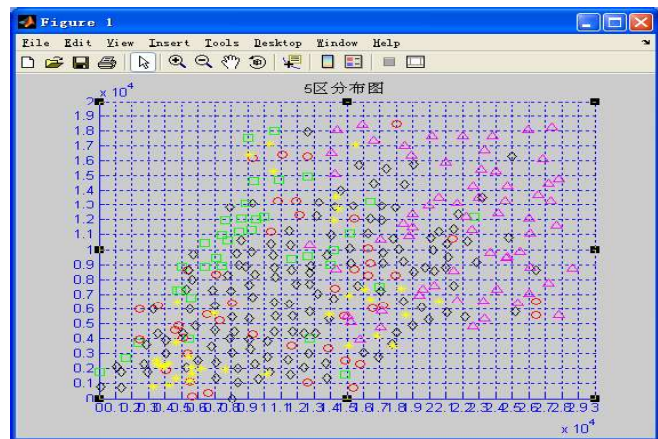
4.3. The main reason for heavy metal pollution

1. Heavy metal pollution of the main reasons: 1. the factory area emissions of heavy metal containing waste, can be seen from Figure 1 Pb, Hg seriously exceeded. 2. a large transport network in the car exhaust emissions and car tire wear caused by a large number of heavy metals containing harmful gases and dust, etc., busy traffic lines so that heavy metals containing harmful gases and dust can be spread along the transport network. And then the layout of the traffic network is unreasonable, so that pollutants can be gathered. 3. mining pollution, in the mining and transportation process caused a large number of heavy metal elements outflow. 4. the green area of the park is located in the outskirts of the city, not to reduce the harm caused by pollution.

Heavy metal deposition in the atmosphere.

4.4. Build a model by analyzing the route of transmission

In the industrial area: mainly through the natural settlement of heavy metals, the pollution degree model is spread from the center to the surrounding.

In the traffic area: heavy metals in the soil on both sides of the highway and railway are mainly polluted by Pb, Zn, Cd, Cr, Hg and Cu. They come from the burning of leaded gasoline, car tire wear and tear caused by zinc dust. They are strip-like distribution, and the intensity of heavy metal contamination on both sides of the road and railway is gradually weakened. With the passage of time, the heavy metal pollution of highway and railway soil has a strong superposition. Therefore, the pollution level of each area can be superimposed, which can more accurately find the source of pollution, can be tested on the source of pollution.

In the mountains: ignore the river, can be considered a model spread from the center to the surrounding.

Build model. 1, the purpose: to accurately find the source of pollution. 2, Method: The griddata function provided by MATLAB software is used to predict the pollution source point, and the pollution source point is obtained by superimposing the influence degree of each element in each district. 3, the conclusion

(1). First, a variety of metal elements in the distribution of various areas, and then a number of possible areas of superposition, to find the source of diffusion, a comprehensive analysis of pollution sources.

Find the source of the Matlab operating procedures

It is through the hold on the program connection, there are eight plans available in front, the distribution of pollution sources, traffic area two,

Industrial area, a living area of a mountain, of which the specific way: 8 kinds of heavy metals in turn replaced by a number of [3 4 5 6] on behalf of a source point to superposition of the program can be the same point

Draw the graph as follows:
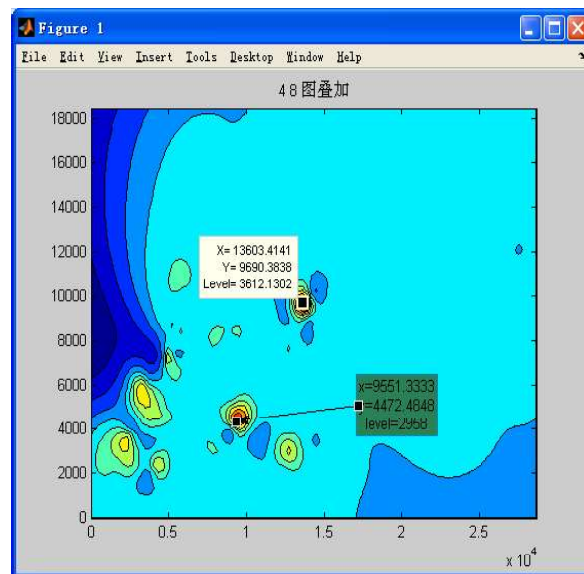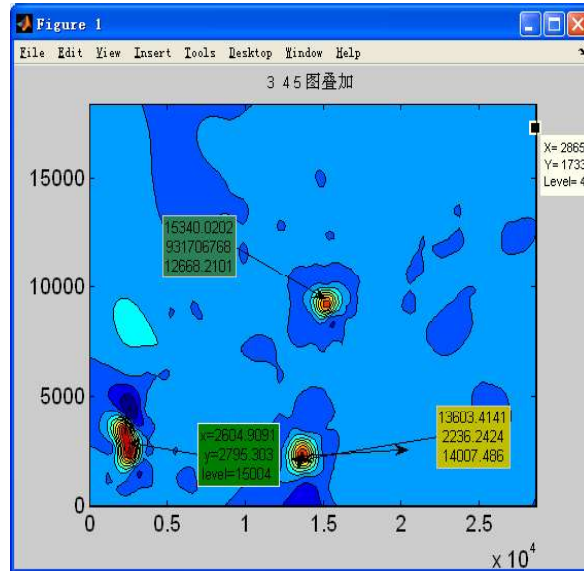
You can get 5 coordinate points, [9551.3333,4472.4848]

[13603.4141,9690.3838]

[2604.9091,2796.303]

[13603.4141,2236.2424]

[153340.0202,9317.6768]

The last point to ignore, so that the four-point corresponding to the three-dimensional point

5.   Advantages and disadvantages of the establishment of the model

Advantage:

1. There is no consideration for altitude, because the only one position can be determined according to the vertical and horizontal coordinates, so there is no need to consider the elevation.

2. For the data processing more detailed, intuitive, showing a comprehensive distribution map.

3. Boldly used the idea of soil pollution index processing methods.

4. Because the data is divided into the suburbs of the urban area per square kilometer, which contains all the conditions of the city, so the data is extensive, so the data is not screening.

5. Due to the high concentration of soil pollution is more serious, so this article will be a higher concentration of elements to expand the treatment.

6. As the urban deviation from the average larger, so the data are processed.

Disadvantages:

1. The background value of the consideration of some simple, may lead to a certain error in the dirt index.

2. The soil classification data in this paper is man-made, and its actual value between the inevitable there will be some error.

6.   The expansion and application of the model

The data of the soils of the same sampling points in the past 10 years and 20 years should be collected, and the difference between them can be calculated and the change of the content of each element in the soil can be drawn by using Matlab software to understand the evolution pattern of the urban geological environment. The population should also be collected over the past 10 years, 20 years, population changes and factory development. It is helpful to study the evolution pattern of urban geological environment under the influence of human social activities by making changes in population density maps and changes in soil elements

Set all the factors, the establishment of related equations, and then predict

7. Reference

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