Variation of PM2.5 concentration at some typical districts in Chengdu

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Abstract. Aerosol particles are one of the most variable components in the Earth’s atmosphere. The study of aerosol properties plays an important role in science and application. The PM2.5 concentration at different locations in Chengdu city is studied in this paper. In order to measure the PM2.5 concentration at different locations in Chengdu city, three areas including the commercial district, the university area and the overpass in the main road are choose to represent the typical locations. The variation of PM2.5 concentration with time at different locations and different dates are tested with the particle instrument. According to these results, it is obvious to understand that the PM2.5 concentration is different at different location even within the same time. If with the conditions of rainfall and wind, the PM2.5 concentration will be reduced rapidly.

1. Introduction

Nowadays, the problem of urban air pollution has been paid more and more attention, which troubles the metropolises all over the world. Reducing air pollution and restoring clean blue sky in cities has become the consensus of people all over the world. Because the composition, source, concentration and duration of pollutants are different, when the urban atmosphere is polluted, the regional climatic conditions, meteorological environment, geographical conditions and other factors vary from place to place. With the different human health and tolerance, the degree of harm to the human body also has its weight[1].

In the atmosphere, particles matter with diameter less than 2.5 μm are called PM2.5. PM2.5 is the basic pollutant in the air environment of large and medium-sized cities in China, and it is the decisive factor to define the air quality of a city[2].

In order to reduce the level of air pollution and improve air quality, our governments have formulated corresponding laws and regulations to control the number of pollution sources and reduce the proportion of air pollutants discharged. Therefore, the study of PM2.5 is of great significance[3].

2. Method and results

Chengdu is located in the west of the Sichuan Basin, with an elevation drop of 5,000 meters within the city. The meteorological background of mountainous area, hilly area and plain area is very different. The overall wind speed is small, and the static wind frequency is high. In winter, the fog days are very common, and there is a temperature inversion layer all the year round[4]. Chengdu is one of the two major static wind areas in the country, and it is not conducive to the horizontal and vertical diffusion of air pollution. Moreover, urban population density, large number of motor vehicles, industrial agglomeration, pollutant emission concentration, and large emissions make it more difficult to prevent and control air pollution[5].
In this paper, we use the Dust Trak DRX Aerosol Monitor (Model 8534) to test the PM2.5. This instrument is produced from TSI American Company. In addition, we choose several typical locations in Chengdu city to make the measurement of PM2.5 including the commercial district, university area and the overpass in the main road[6].

In the commercial district, the characteristics of the road at this measurement point are that there are more vehicles and pedestrians, the commercial district is closed to the medium-sized residential area, and there are supermarkets, restaurants, entertainment venues. Buildings are dense and the average height is higher. The vegetation coverage is not high, and the main motor vehicles are family cars and buses.

In the university area, it is close to the student dormitory building, and there are small restaurants, supermarkets and shops nearby. It has a general density of buildings and a high degree of vegetation.

In the overpass of the main road, there are more vehicles, and fewer pedestrians. The greening plants near the road are not ideal.

All these locations are typical areas to make some measurement of PM2.5 to research the influencing factor and the relation of these factors. In this paper, we choose the measured data of PM2.5 concentration at different locations on 21th May and 23th, May 2020. Through these data, we can determine the difference of the PM2.5 concentration at different locations, and understand the influencing factor and the relation of these factors.

Fig.1 is the PM2.5 concentration at commercial district on 21th, May 2020. The unit of PM2.5 concentration is g/m³, and the unit of horizontal axis is time. We test the PM2.5 at this afternoon, and we display the relation between the PM2.5 concentration and time. Fig.2 is the PM2.5 concentration at university area on 21th, May 2020. Fig.3 is the PM2.5 concentration at overpass in the main road on 21th, May 2020.

According to these three figures, we can see that the PM2.5 concentration is different at different location even within the same time. In generally, the PM2.5 concentration at commercial district is higher than other locations. When there are more vehicles, the PM2.5 concentration at overpass in the main road is abruptly high, and when there are fewer vehicles, the PM2.5 concentration at overpass in the main road is lower.

Fig.4 is the PM2.5 concentration at commercial district on 23th, May 2020. Fig.5 is the PM2.5 concentration at university area on 23th, May 2020. Fig.6 is the PM2.5 concentration at overpass in the main road on 23th, May 2020. After two days, the PM2.5 concentrations at these three locations are all reduced since the rainfall of that day. So we can see that the rainfall and the wind can reduce the PM2.5 concentrations. In addition, when lots of vehicles pass the overpass in the main road, the PM2.5 concentration is very high.
Fig. 2 PM2.5 concentration at university area on 21\textsuperscript{th}, May.

Fig. 3 PM2.5 concentration at overpass in the main road on 21\textsuperscript{th}, May.

Fig. 4 PM2.5 concentration at commercial district on 23\textsuperscript{th}, May.
3. Conclusions
In this paper, the PM2.5 concentration in Chengdu city is studied, and the particle size instrument is used to test the PM2.5 concentration at different time. We choose three typical locations to make this research. These three locations have obvious characteristic to study the variation of PM2.5 concentration. We test the PM2.5 concentration at the commercial district, and university area as well as the overpass in the main road. According to these results, it is obvious to understand that the PM2.5 concentration is different at different location even within the same time. In generally, the PM2.5 concentration at commercial district is higher than other locations. When there are more vehicles, the PM2.5 concentration at overpass in the main road is abruptly high. If with the conditions of rainfall and wind, the PM2.5 concentration will be reduced rapidly.

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