Review of Atmospheric Exposure Assessment

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Abstract. Long-term exposure to air pollution can lead to an increase in the incidence and mortality of respiratory and cardiovascular diseases. This article mainly discusses in recent years the academic circles of atmospheric exposure assessment related research results, through combing reading atmospheric exposure assessment of the relevant literature, clarifying the concept of atmospheric exposure assessment, and the integration based on previous studies, the paper points out others study.

Introduction

With the advance of world industrialization, air pollution is becoming more and more serious, and long-term exposure to air pollution can cause the increase of morbidity and mortality of respiratory and cardiovascular diseases. Therefore, the prevention and control of air pollution is imperative. The study of exposure assessment of air pollutants is beneficial to the understanding of air pollution and the adoption of measures. Therefore, in this paper, by analyzing the atmospheric exposure assessment, model research, the concept of integration of the current research situation, the application of the model results, advantages and disadvantages were discussed, based on the atmospheric exposure assessment is prospected for the future, has integrated the academic achievement of academic significance, at the same time with the atmospheric exposure assessment in reality to provide the reference of practical significance.

Concept of Atmospheric Exposure Assessment

In recent years the researchers combined with the reality of our country, introduce the international general risk quantitative evaluation method in the study of air pollution, such as the hazards identified, dose - response relationship assessment, exposure assessment and risk features into research, quantitative evaluation to the residents' health because of the atmospheric pollutants concentration changing and what impact.Among them, the most important link in initiating pollution health assessment is exposure assessment.Exposure, as the name suggests, is a period of time in which the body's various organs, such as: nose, mouth, and so on, contact.The process of a pollutant. From the point of view of air pollutants are generally breathing into the human body to affect the human body, through the skin, diet and other into the human body is a minority, the human body in a fixed time exposure to a certain amount of pollutants is the amount of exposure.Exposure assessment refers to the method to determine or estimate the size, frequency, duration and route of exposure.

Air Pollution Exposure Assessment Model

Approximation Model

The principle of proximity models is a relatively simple type. In general, the main approach of proximity models is to compare the distance between the site in the study and the air pollution source.The principle used in the comparison with the proximity model is to adopt the grading system, that is, to divide the distance into different grades. For example, zhao ang, Chen renjie and kan haidong cited GAUDERMAN's study to divide the differentiated distance into four levels: less

than 500 meters, between 500 meters and 1,000 meters, between 1,000 meters and 1,500 meters, and more than 1,500 meters.In general, people in the study who were farther away from the source of the pollution had less health damage than those who were closer. According to his study, teens who lived less than 500 meters from a major artery suffered more damage to their lung function than those who lived 1,500 meters away.

The primary evaluation purpose of the proximity model is to examine the correlation between traffic exposure and health. Zhao ang, Chen renjie and kan haidong discussed the application of the approach model, citing the results of ANDERSSON and WILLIAMS, and proposed that the approach model could be used to find that traffic exposure could increase the risk of asthma in children and reduce the proportion of natural killer cells in postmenopausal women.Deng furong, wang xin and su huijuan also used the proximity model to prove that the distance to the main road has a great effect on the exposure of pollutants to children.Huang jing and guo xinbiao discussed the research status of exhaust pollution exposure assessment methods for motor vehicles.The approach model can be used to evaluate the air exposure of vehicle pollutants.

Zhao ang, Chen renjie and Kan haidong discussed the advantages and disadvantages of the approach model. After the study, they pointed out that simplicity, low cost and high frequency of GIS use are the biggest advantages of the approach model.However; in addition, there are also some disadvantages of the approach model. For example, although qualitative judgment can be carried out, quantitative research is difficult to be carried out, and the report accuracy may be affected by other factors, such as wind direction and terrain. Overall, close to the model is still belongs to the high cost performance of atmospheric exposure evaluation model, in the process of running without too much only to the current data resources reasonable use can be evaluated effectively, thus has strong feasibility, the other in terms of distance measurement, can choose by the objective measurement method to accurately evaluate the crowd pollutants exposure levels.Therefore, we can choose to study the impact of traffic pollution on people in China through the approach model, thus obtaining the data of traffic flow and crowd distance from traffic road.

Statistical Interpolation Model

Generally, the interpolation model is applied in geographic information statistics. When obtaining the pollutant concentration in the study area, the pollutant data can be determined by the monitoring points set around the study area.This model includes many kinds, such as kriging method and spline function method.The kriging method after research and practice are all considered to be the best way to conduct research in the field of air pollution, the kriging method, the variation function theory and the analysis of its structure as a foundation, and then in a limited area to variable unbiased estimates of optimal values, using this method can not only consider the relative position between the known and the interpolation points, more can also consider all known points in the middle of the relative position relations.However, if this model is to be applied, ArcGIS should be combined to obtain the changes of pollutant practice and space.

Meng jian and ma xiaoming obtained the estimation error after studying the spatial characteristics of pollutants in a certain place, and the relevant results showed that the kriging method had a better effect in the analysis and interpolation of urban air pollution space.Liu jie, netsnake, when lu wen-sheng exploration on the spatial and temporal correlation of pollutants, also choose pollution by using time series and space difference effectively precise analysis together, when research through the study of the use of higher dimensional space interpolation algorithm, which can accurately to Beijing any fabric grid month average to calculate mass concentration of pollutants, so the different monitoring point data can be in the form of distribution, spatial resolution monitoring results which can be effectively improved.

The advantages and disadvantages of statistical interpolation model are also discussed. After the study, fu liwei and guo xiurui proposed that the interpolation model has more advantages, such as better use of monitoring data, so that the reliability of exposure evaluation results can be significantly improved. The time and space distribution of air pollution concentration can be estimated. However, they also pointed out that although the statistical interpolation model has many

advantages, it also has some disadvantages. Secondly, the quality of monitoring data generally affects the accuracy of assessment. Finally, technical operators and software are needed.

Land use Regression Model

The method of applying land use regression model to air pollutant exposure assessment model mainly refers to the method of combining local land use, traffic characteristics, population density and other factors together to discuss and evaluate the air exposure degree of regional pollutants.Xu wei discussed the land use model in the paper, and he believed that the key factors of land use regression were as follows: traffic variables, height, topography, weather and location, population or address density, etc.The selection of monitoring points can best reflect the change of pollutant concentration. The number of monitoring sites in most studies is between 20 and 100.Up to now, this model has been generally used to investigate and study the exposure of various pollutants to the atmosphere. Chen li, zhi-peng bai, Su Di through study and put forward, in terms of the current international environment health, more notice when research to urban area atmospheric pollutants exposed the health risk assessment for a long time, and in the study of long exposure assessment model of use frequency is highest is land use regression model, in addition, they argue, the model to be successful is a little content is indispensable: pollutant concentration monitoring data.

In China, land use regression model is widely used to evaluate air pollutant exposure. Xu wei believes that long-term exposure to air pollution may lead to increased incidence of respiratory and cardiovascular diseases, resulting in increased morbidity and mortality, so she USES land use regression model to study.

When Chen li, Zhi-peng Bai, Su Di study choose to make full use of the regression model of land use spatial distribution of the concentration of air pollution in tianjin is relatively accurate simulation, finally it is concluded that the R distribution of PM 0.964, 0.691, and NO fusion and if it will be the wind factors in R2 will get corresponding improvement, 0.980 and 0.849 respectively. Although the land use regression model generally does not need relevant pollution source data when simulating the spatial concentration of air pollution, even so, in order to ensure the accuracy of the model. The study area still needs to be nested in a grid. In general. Although Chen li's research has a high degree of perfection, but the grid still needs to learn from foreign experience refinement. In addition, Chen li's study did not effectively combine pollutant data and health data to discuss the health hazards of pollutants to human beings, so there was some deficiency.

Atmospheric Diffusion Model

Hong-bin Yang, etc. For the interpretation of the atmospheric diffusion model, he thought the atmospheric diffusion model is mainly from the Angle of pollution sources on this, the use of environment variables on meteorological data (wind speed, wind direction, pressure, temperature, relative humidity, cloud cover), and terrain factors such as migration, proliferation and transformation of pollutants play a role for atmospheric pollutants concentration on temporal and spatial scales of exposure assessment.He believed that the core of the atmospheric diffusion model was gaussian equation, and the data were mainly based on the detection data of pollutants detected by fixed detection stations set up near the study site, so as to correct the model.There are many types of diffusion models, such as EPISODE diffusion model developed by the Norwegian air research institute, CALINE model developed by the California department of transportation, AIRVIRO diffusion model developed by the Swedish institute of meteorology and hydrology, and AERMOD diffusion model jointly developed by the American meteorological association and the us environmental protection agency.While Huang Jing on top of this, the data of the motor vehicle emissions is also included in the model simultaneously, in order to motor vehicle exhaust is estimated with the change of time and space, and use the data of the motor vehicle emissions are mostly about the quantity, type, each type of the motor vehicle emissions standards, the speed of information as well as the condition of the highway network.Motor vehicle emission data are simultaneously incorporated into the model to estimate the variation of motor vehicle exhaust over time and space. Motor vehicle emission data include the number of motor vehicles, their main types,

the standard emission of each type, the speed of motor vehicles, road network status and other information.

Currently, atmospheric diffusion model is the most widely used in atmospheric exposure assessment. In the academic circles at home and abroad, there are a lot of studies that establish atmospheric diffusion model to assess the concentration of atmospheric pollutants. For example, tian fengyun and others selected the type of atmospheric diffusion model, and then the ISC3 atmospheric diffusion model was used to select the yimin mining area with serious air pollution for verification and application.The empirical results show that there is a good correlation between the daily average of initiated particles obtained by ISC3 air diffusion model and the daily average of monitored particles.Wang haichao et al. summarized the AERMOD diffusion model in atmospheric diffusion model from the theoretical level.Hong-bin Yang, is we do empirical research on AER - MOD air diffusion model, not only from the theoretical level for the use of the model is illustrated, and in shenyang city simulation application and verification, the empirical results, said the use of AER - MOD air diffusion model to particulate matter that simulate a monitoring of daily average daily average correlation is better.Yin cuiqin et al. selected the CALINE4 model from the atmospheric diffusion model bear to predict the pollutants emitted by motor vehicles on the highway.The results show that the daily mean values of NO2 concentration simulated by the model are consistent with the actual trend in different meteorological conditions.

According to zhao ang, Chen renjie and kan haidong, after sorting out previous theoretical and empirical studies on atmospheric diffusion model, the advantages of atmospheric diffusion model are as follows: firstly, there is no need for large-scale monitoring network; Secondly, it can provide pollution data of air pollutants with higher spatial and temporal resolution. The variation of atmospheric pollutant concentration caused by different meteorological, pollution sources and terrain conditions can be fully considered, and the exposure level of human body can be objectively evaluated under such circumstances. According to fu liwei and guo xiurui, the advantages of atmospheric diffusion model are as follows: first, it can combine the changes of air pollution in time and space, and it does not need intensive monitoring network.It can provide higher-resolution analytical models for studying the relationship between human health and pollutants, which can be applied to the monitoring of relatively subtle changes in different study areas.

As for the deficiency of atmospheric diffusion model, zhao ang, Chen renjie and kan haidong think that there are the following points.Sometimes the result of evaluation error is caused by the difference between the assumptions and the reality of the model. Cross-validation of monitoring data is required; Expensive hardware equipment and high operating capacity of the software operators; The effects of individual temporal activity patterns were not considered, and exposure levels in different microenvironments were not well assessed.According to fu liwei and guo xiurui, the shortcomings of atmospheric diffusion model are as follows: first, both data input and model operation are time-consuming and costly, with high cost of money and time.Secondly, it is difficult to cross check the monitoring data. The results were affected by a temporary mismatch or misclassification of the data.

Summary

Atmospheric exposure assessment refers to the method to determine or estimate the exposure amount, frequency, duration and route of atmospheric pollutants. With the increasing severity of global air pollution and the increasing threat to human health, the study of atmospheric exposure assessment is very necessary and an important topic of current research at home and abroad. In this paper, by analyzing the concept of integration of atmospheric exposure evaluation study of the literature and the use of atmospheric exposure assessment model to study the related literature, thus clarifying the concept and basic model of atmospheric exposure assessment, this article combed the main atmospheric exposure assessment model are close to the model, the statistical interpolation model, diffusion model and regression model of land use, and on the basis of the advantages and disadvantages of exposure assessment model of atmospheric pollution were discussed, analysis of each case should use model, and forecasted.In order to improve the effectiveness of atmospheric

exposure assessment, cross cooperation among environmental science, environmental engineering, environmental health and other disciplines should be promoted, which should not only simulate the exposure level but also estimate the harm of pollutants to health.

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