The study by Ma et al. (Variations of atmospheric PAHs concentrations, sources, health risk, and direct medical costs of lung cancer around the Bohai Sea under the background of pollution prevention and control in China) conducted 5-years observation of polycyclic aromatic hydrocarbons (PAHs) at 12 sampling sites at the coastal area of Bohai Sea. The data were analyzed using the positive matrix factorization (PMF) for source apportionment. The major findings include reduction of PAHs during the observation period that is likely related with implementation of emission control policy and identification of coal combustion as a major emission source of PAHs in the region. The technical approach of the study sounds. It is a useful dataset, and the topic is suitable for the journal. Descriptions in the manuscript are redundant at many places. The reviewer believes that the manuscript will be much easier to be read by employing short and direct expressions. The reviewer suggests the authors to ask for a professional editorial service for better organizing the manuscript, and correct grammatical errors.

Thank you very much for the suggestion. We have asked a native English speaker to polish the grammar of the manuscript, such as Line 32, Line 54-55, Line 100, Line 262-263, and Line 493-494.

Comments

(1) Abstract: Acronyms (e.g., PAHs) should be defined before its first appearance.

Thanks for the suggestion. It has been modified, see Line 22-23.

(2) References for introduction

This is a study for atmospheric observation in China. It is not surprising that the introduction section contains numerous papers by research groups in China. However, the reviewer feels that the fraction of references from China is too high so that it could hinder contributions of researchers in other countries to the area. For instance, health risks of PAHs have widely been investigated all over the world. The reviewer suggests the authors to re-conduct literature survey and reorganize the introduction. The revision will help attracting attention of scientists in the area from other countries.

Thanks for the suggestion. Relevant sections have been modified in this study, "Previous studies were shown that PAHs in the atmosphere of heavily polluted areas such as factories and the urban posed a threat to human health, especially the respiratory system (Agudelo-Castañeda et al., 2017; Ramírez et al., 2011)" see Line 51-53, "According to the statistics, the incidence and mortality of lung cancer were ranked first among cancer-related cases in the world, and so the lung cancer risk owing to exposing to PAHs was of particular concern and widely assessed (Křůmal and Mikuška,

2020; Liao et al., 2011; Taghvaee et al., 2018; Zhang et al., 2023)" see Line 56-59.

(3) Figure 1. abbreviations for PAHs. Abbreviations need to be defined in the main text before their first appearances.

Thanks for the suggestion. It has been defined in the figure notes, "Atmospheric concentrations of polycyclic aromatic hydrocarbons (PAHs) around the BS from June 2014 to May 2019" see Line 226.

(4) Line 207 What is the significant digit for the data in the study? Uncertainties of both chemical analysis and sampling (e.g., uncertainties in sampling flow rate, time) would need to be considered for providing numbers. The reviewer suggests the authors to revisit the significant digit for all the numbers (e.g., concentrations and fraction) in revising the manuscript.

The significant digit for the data of this study were modified according to the previous research results of our research group (Wang et al., 2018), and the numbers in this manuscript were modified, such as in Line 27, Line 213, Line 232-234, Line 254-255, and Line 279.

(5) L223 Why was the spring selected as the start of the cycle?

Because the sampling time of this study lasted from summer 2014 (June) to spring 2019 (May) for 5 years. In order to better characterize the change of PAHs, a whole year was selected as the research object, and the period from summer 2014 to spring 2015 was exactly one year, so summer was selected as the beginning of the cycle.

(6) L241 Could the authors provide some potential reasons why emission from high temperature combustion sources reduced during the study period?

High temperature combustion emission sources mainly included industrial and vehicle emissions, such as coal-fired power plants, automobile exhaust. The Chinese government has implemented various stringent measures to reduce air pollutant emissions over the past two decades, such as promoting ultra-low emission and ultra-high combustion technologies, promoting new energy vehicles and implementing strict emission standards, and strengthening process optimization and energy efficiency. Air pollutants from coal-fired power plants decrease from 2014 to 2019. (Wang et al., 2020) PAHs emissions from industrial coal, gasoline, and diesel oil increased by 7.8, 10.8, and 10.0 times, respectively, from 1980 to 2016, and then decreased by 4.3%, 13.5%, and 17.6%, respectively, during the period from 2017 to 2020. (Cao et al., 2022)

(7) L255 The meaning of the sentence is unclear. Please update.

Thank you for your advice. The sentence has been corrected by consideration of context.

The original text was “This indicated that there were other important pollution sources for LMW-PAHs, followed by MMW-PAHs, which was significantly increasing in winter at the BS region.”. It was changed to the sentence “This indicated that there were nonnegligible pollution sources for LMW-PAHs, especially in winter at the BS region.”, see Line 262-263.

(8) L259 The statement is supported by a reference in 2007. I believe that there must have been some changes in heating in China during the last 15 years. Is there a better reference that supports the statement?

Thank you for the suggestion. “For typical northern families, the consumption of firewood burning and coal in winter was 1.5−2.0 times higher than that in summer due to heating and other activities (Qin et al., 2007). As a result, PAHs emissions in winter were at least 1.5 times higher than those in summer.” changed into “In terms of the per capita fuel consumption spatial distribution, the north and west China were apparently higher than that of southeast China, principally because of the difference in winter heating fuel consumption. Therefore, there were significant seasonal variations of per capita fuel consumption, with peak consumption in the winter months being about twice as high as in the summer months. (Zhu et al., 2013)”, see Line 266-270.

(9) L280 L279 Back trajectory analysis is useful for estimating sources of air masses. However, it does not guarantee that measured atmospheric trace species are also transported through the path. A combined analysis with spatial distribution of emission sources is needed to support the statement.

Thank you very much for your advice. In the manuscript, we added the relevant spatial distribution information of pollution emission, see Line 290-293 “According to the distribution of atmospheric PAHs in some representative parts of northern China, it was found that the Beijing-Tianjin-Hebei region was greatly affected by nearby sources, while Shandong province and other places were mainly affected by regional emissions. (Zhang et al., 2016)”.

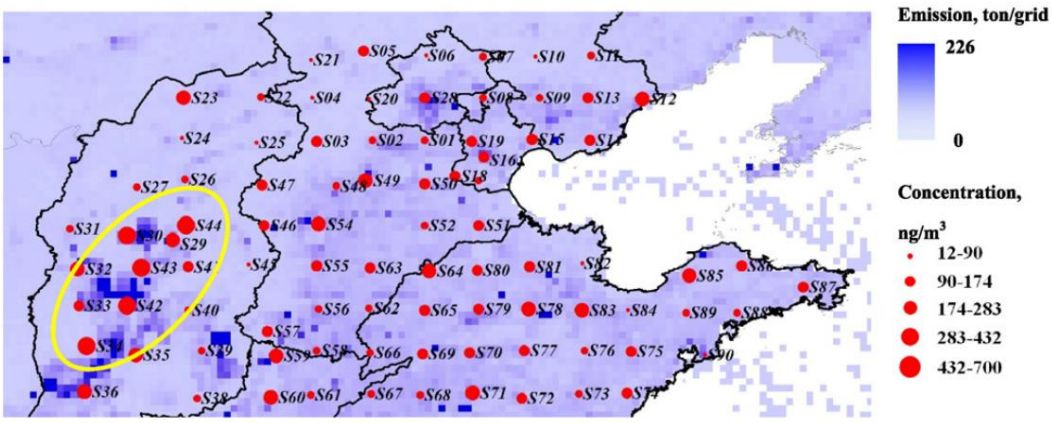

Fig. 1. Measured ambient concentration and emission inventory of total PAHs in North China ("S" denotes site).

(10) L314 what does 'theoretical Q value' mean? Could the authors add a reference to support the statement?

Thank you for your advice. The theoretical Q value in the original sentence was the value of PMF model under ideal conditions. The theoretical Q value was the number of data input to the PMF model minus the number of data available for factor calculation. (Sun et al., 2021). And the reference was added, see Line 326.

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