

Response to recommendations

Comments

Due to the emission uncertainties in air quality modeling prediction, the development of air quality diagnostic prediction method could be practical based on the understanding of the physical connection of meteorological parameters to air quality change. Therefore, the establishment and application of PLAM/h Index (Parameter Linking Air-quality to Meteorological conditions/haze) in this paper are of considerable interest. For the benefit of the reader, however, a number of points need clarifying and certain statements require further justification.

Major comments:

1) With modifying the initial meteorological PLAM (Wang et. al., 2012) with the 2010 PM2.5 emission data, a new parameter PLAM/h is developed for haze forecast. Please note that a) these PM2.5 emission data provide only the primary emission, and the secondary aerosol particles contribute more than half PM2.5 to haze formation in China. This contribution of secondary aerosols with their precursor emission should be considered into the PLAM/h development;

Response: We agree with the reviewer's good advice that the contribution of secondary aerosols with their precursor emissions should be considered into the PLAM/h development. For the current development of PLAM/h, the primary emissions are used as an indicator for the emission spatial distributions and NOT a quantitative input for the model.

We will do the further optimizations for the secondary aerosol potential contributions to fully engage emission inventories in PLAM/h.

2) To quantify the impact of emission in PLAM index, the probability of its impact on the surrounding area are isotropic in the section 2.3, which is discussible, because the pollutant emissions could influence on the downstream area driven by winds (not all the surrounding areas).

Response: Thanks for your advice. "isotropic" is as a first order approximation to emissions. Impact from downstream wind is expressed in the meteorological conditions.

3) Based on the Figure 2, the two regression lines of PLAM and PLAM/h (see the following Fig.) present less differences in visibility prediction, especially for haze (Vis. <10k m).

Response: Figure 2 shows that a reasonable correlation exists between PLAM/h and visibility regardless of emission contributions and the difference between red and black-dashed lines is not visually obvious. However, the determination coefficient (R^2) is increased from 0.3675 to 0.3887 when emissions are considered, indicating the importance of inclusion of emission in PLAM/h.

4) This paper uses the near real-time (NRT) operational data, including surface observation data. Please clarify the NRT data, which are the modeling forecast data or observation data. How can these data be used to 24h forecast?

Response: As a parameterization method, PLAM/h uses the NRT observation data for a short time or short term forecast. The NRT atmospheric observation data are used in the Equations (4,5 and 6) to calculate q_s (humidity), f_c (condensation function), and (wet-equivalent potential temperature) etc, which then are substituted into the Equation (3) to obtain the "static stability" of air masses in the diagnosis and trend prediction of air quality.

5) The English language should be substantially improved. For example, please use "haze" to replace and correct "atmospheric fog-haze", "fog-haze" "visibility fog-haze", all of which are Chinese English "haze".

Response: Thank you for suggestions. Further modifications were made for the English language, replace "atmospheric fog-haze" to "haze" and so on.

Specific comments:

1) In this paper, the coefficient of determination R^2 is used in analyzing correlation between visibility and PLAM Index. It can not be called the correlation coefficient. The correlation coefficient is R .(line 24,223,315,371,387,423...)

Response: Thank you for suggestions. Modifications are made, replace "correlation" to "determination" in R^2 .(line 24,223,315,371,387,423...)

2) The correlation fitted lines of PLAM index value without emission are marked by yellow dashed line instead of "black dashed line" . (line 220)

Response: Modified figure 2: The correlation fitted lines of PLAM index value without emission are marked by blue dashed line instead of "black dashed line" . (line 5,10page)

3) According to Fig. 4a, when $PLAM < 100$, visibility is not less than 10 km, but larger than 10 km. (line 323)

Response: Modify text associated as follow: " when $PLAM < 150$, visibility is not less than 10 km" (line 14-15,page 13)

4) In Fig. 5, R^2 is always less than 1, so the value of the figure should be between 0-1, but not between 0-100.

Response: Figure 5 modified, that is the icon for 0-100%, drawing the R^2 value magnified 100 times