

C2253:

Comment:

It is better to quantitatively divide the impacts of relative humidity and aerosol on visibility.

Response: Thank you very much for your suggestion.

Quantitatively dividing the impacts of relative humidity (RH) and aerosol on visibility is a very complicated issue. Hygroscopic growth factor of aerosol varies with different chemical composition and physical properties. We don't have long-term observing data of chemical species and size distribution of aerosol in Beijing. If we don't consider the variation of chemical and physical properties of aerosol (assuming that aerosol's chemical composition and size distribution are relatively constant, especially in annual variation), we can roughly quantify the effect of RH and aerosol on visibility from Figure I. The method is described as follows.

Firstly, we use the daily visibility and PM10 data in August during 2003-2008 to fit the formula: $VIS = f(RH, PM10)$. The fitting result is shown as the contour line in Figure 8. Secondly, we calculate the mean RH, PM10 and Visibility in August of 2003-2007 and of 2008, respectively. So we can derive the 2008 anomaly. Finally, we decrease the mean RH of 2003-2007 to that of 2008, and we could get the visibility improvement when just changing RH. In the same way, the PM10 effect on visibility can be derived. According to the change ratio of RH and PM10 on visibility, then we could calculate the percentage of RH and PM10 impacting on visibility, respectively. By calculating and evaluating, we get the result that aerosol reduction contributes primarily to improving visibility in August of 2008. The ratio of RH's effect to aerosol's is about 1:4.

We are still searching for a more efficient and objective way to divide the impacts of RH and aerosol on visibility.

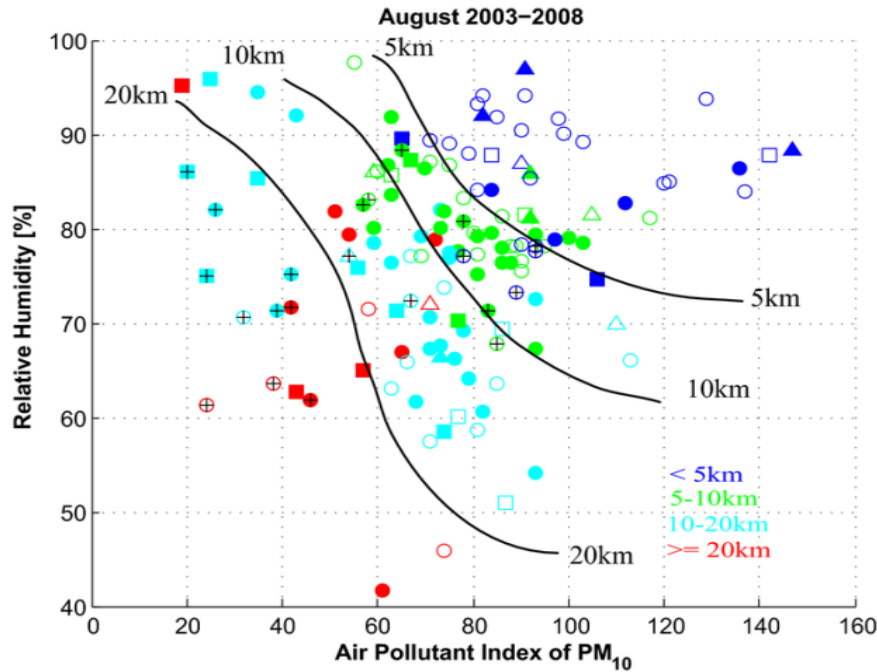


Figure I. Daily mean visibility distribution in relation to RH, PM_{10} index, wind speed, and wind direction for August from 2003 and 2008 in Beijing. Blue symbol represents visibility lower than 5 km, green symbol represents visibility lower than 10 km and no less than 5 km, cyan symbol represents visibility lower than 20 km and no less than 10 km, and red symbol represents visibility no less than 20 km. The symbols with “+” represent observation in 2008. Triangle represents wind speed lower than 1.5 m s^{-1} , circle represents wind speed greater than 1.5 m s^{-1} and lower than 3 m s^{-1} , and square represents wind speed greater than 3 m s^{-1} . Hollow symbols represent wind directions of south, southeast, east, and southwest. Solid symbols represent wind directions of northeast, north, northwest and west. The black solid lines denote the visibility contour of 5 km, 10 km and 20 km.