Atmos. Chem. Phys. Discuss.,
doi:10.5194/acp-2016-738-RC1, 2016

Atmospheric Chemistry and Physics Discussions

Interactive comment on "60 years of UK visibility measurements: impact of meteorology and atmospheric pollutants on visibility" *by* Ajit Singh et al.

Anonymous Referee #1

Received and published: 28 September 2016

This is an interesting study that measures 60 years of UK visibility in different environments (e.g. urban, rural, and marine) and shows the impact of meteorology and atmospheric pollutants on visibility. The authors use horizontal visibility data along with meteorological data from British Atmospheric Data Centre (BADC) to analyse UK visibility trends from 1950-2013. Although the authors extend the work of Doyle and Dorling (2002) to analyse UK visibility trends, but the reviewer find the dissimilarities of visibility values between Singh et al. (2016) and Doyle and Dorling (2002) results for the period of 1950 to 1997. The authors should explicitly describe why the visibility values presented in their study is different than the results from similar study by Doyle and Dorling (2002). In addition, specific descriptions on the explanations and discus-

sions on atmospheric sciences (e.g. reason for the reduction of air pollutants in urban areas) are insufficient. The author also develop a light extinction model for generating predictions of historic aerosol and gas scattering and absorbing properties. But the authors should provide more detailed discussions on the uncertainties which can arise in their modelling study. More specific comments are provided under 'Technical comments'. The manuscript is reasonably well written, but there are a lot of typographical errors throughout, which are noted under 'Editorial comments'. In my opinion, the manuscript is worth publishing, but some reviewer's concerns existed, which need to be addressed, then this should end up being a paper suitable for publication in ACP. Technical comments 1. Generally the reduction of visibility is found with increasing aerosol particles concentrations which has been explained briefly in introduction part of the paper. The results in this paper shows that the visibility of the urban areas has been improved year to year due to the reduction in air pollution for most of the monitoring stations in UK. But very little has been discussed about the possible reasons of the reduction in air pollution. Are they for cleaner fuel usage in the vehicles? Is it for increased deposition at the building surface due to the urbanisation and human population? Or do the authors have any other suggestion? In marine and rural environments, the natural emissions of aerosol precursors (e.g. DMS from ocean and terpenes from rural plants) are dominating which cannot be controlled. Do the authors think that this could be the reason for decreased visibility over time for marine and rural stations?

2. After comparing the visibility results of this paper with Doyle and Dorling (2002) results, the reviewer found the similar variation trend for the period of 1950-1995, but the visibility values are found to be lower for all stations in this study than Doyle and Dorling (2002) study. Why does this paper produce lower visibility values? No explanation/comparison has been shown in the paper.

3. 12 noon data has been taken as the daily data, however there could be the variation of the visibility throughout the day because of the variation of the meteorological parameters and the concentration of aerosol particles. These need to be discussed as

the uncertainties of their results. The authors excluded the data for 99% precipitation. How much percent data points of 99% precipitation? How the whole data analysis has been affected after excluding these data points? 4. Page 1: The reviewer think that some of the sentences (e.g. Moreover, degradation in visibility can be hazardous to . . ..sea and air accidents, The site locations include . . .. marine environments, the model incorporates parameterizations . . ..and particle and gas adsorption) in Abstract are not meaningful. Instead, they can only be placed in introduction and methodology part. 5. Page 2 Line 3: The literature review (WMO, 2003) is very old. The authors should consider updating their literature review by using recent report by WMO (2015). There are some other places in the introduction part where the references can be updated. Reference: World Meteorological Organization, 2015: Manual on the Global Observing System. Volume I – Global aspects, (WMO-No. 544), Geneva.

6. Page 4, Line 32: The reader might be confused in many places of the manuscript as authors used 'human observation' and 'manual observation' for same meaning. As human observation is more common term for visibility measurement, the reviewer suggest the authors to change 'manual observation' to 'human observation' throughout the manuscript. 7. Page 5, Line 20-24: The authors claimed that at high visibility the automatic sensors perform sub-optimally at coastal site (e.g. Tiree) due to accumulation of sea salt residue. If this is the case, it will also be applicable for another coastal site, Leuchars. But the station Leuchars did not show any deviation when the measurement moved from manual to automation. How the authors will explain the different measurement behaviour for similar type of stations, Tiree and Leuchars? 8. Page 9, Line 4: What localized sources close to visiometer at the Plymouth site? Are they aerosol particles? 10. Page 10, line 9-13: The sentence is contradictory to the reviewer. The reviewer can see from the decadal polar plot that the visibility has been improved decade to decade when the wind comes from the south to east direction, but the reviewer doesn't understand how this is connected with the part "the higher wind speeds from the direction of Belfast leads to lower visibility over Aldregrove". Overall

the lower visibility in the south to east direction can suit with the above statement. 11. Page 12, Lines 10-15: Is there any specific reasons for higher visibilities on Friday for Leuchars and on Wednesday for Ringway? 12. Page 13, Line 5: It would strength the manuscript if the authors can show the relationship of the visibility with temperature. From Fig 5, the reviewer can't see any relationship between visibility and air temperature. 13. Figure 2: Measurement methodology Supplementary Table shows that the measurement was performed manually at Ringway from 2004 to onwards, but in the figure-2, there are no data points from 2004. And also the shading should be white as they are manual measurements. And for Heathrow, the red shading and blue shading are the measurements using the same instrument? 14. Figure 5: The reviewer doesn't think this figure is necessary, as most of them already shown in previous figures. Instead, this figure can be placed in the supplementary Information. However, the rose plot for annual average (for full data series) can be placed in the main manuscript which will be easier for reader to see the overall influence of wind speed and wind direction on visibility. The decadal seasonal polar plots can be kept in Supplementary Information. 15. Figure 7: The green shaded region has been shown from 1990s, but most of the stations start visiometer measurement from 2000. Will it be 2000s instead of 1990s?

Editorial Comments Page 1 Line 16: examples of urban areas are preferable. Page 2, Line 23: 'sharp changes' can be replaced by 'sharp decreases' Page 2, Line 25: 'describe' need to be replaced by 'described' Page 3, Line 23: 'decline' should be 'been declined' Page 4, Line 4: 'to' needs to be added in between 'help' and 'explain' Page 4, Line 5: 'They' should be replaced by 'We'. Page 4, Line 29: Is the term 'human observation' or 'human observer'? Page 5, Line 10, please delete 'than' Page 5, line 25, please add 'the' after assess

---

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-738, 2016.