Review of Li et al., "Evaluation and application of multi-decadal visibility data for trend analysis of atmospheric haze"

This manuscript represents an admirable effort to reduce, analyze, and interpret a global visibility data set in the context of changes in global air quality and haze. Specifically, human-observed visibility data from thousands of stations were combined with other measured aerosol parameters and SO_2 emission data to assess trends in global haze since the mid-1990s over the United States and since the early 1970s in Europe and Asia. Trends in visibility generally were consistent and validated with trends in SO_2 emissions and other ground-based aerosol data sets, such as reconstructed aerosol extinction and $PM_{2.5}$ mass. Human-observed visibility data are particularly challenging for trend analysis due to the many possible associated biases. The authors approached these challenges in a careful, objective, and consistent manner. The paper was well-written and the methods were generally well-described. The analysis and results are important contributions to the understanding of global haze trends in the context of changing emissions, especially with respect to the response of haze to regulatory and economic activity on a global scale. A weakness of the data set is its inability to resolve clean conditions, for example, across the western United States. This weakness biases the results to regions of higher haze degradation. The shortness of the trend periods is also a weakness; longer periods would provide more robust trends, as the authors indicated. It is not clear whether analysis of the shorter time periods were always necessary, especially over Asia. Overall, I recommend the paper be published after addressing specific comments provided below.

Specific comments:

Page 3, line 16-26: This paragraph is a bit disjointed. It switches from variability in haze trends due to changing emissions to inherent uncertainties in Vis.
Page 3, line 27: Are the data used in this paper the same as those reported by Wang et al. (2012), and if so, is the inherent discrepancy resolved?
Page 5, line 19: Consider removing Figure 1 for space. The information is conveyed in the text, and the number of remaining stations after each step can be included in the text.
Page 5, line 24: Do each of these stations have collocated RH measurements?
Page 7, line 22: Clarification: Were change point detections required to occur at the same time in **both** the 50^{th} and 75^{th} percentiles to determine an actual change point? Is a minimum amount of data required after a detection point to determine if it was an actual change (e.g., 201304 50^{th} percentile detection)?
Page 9, line 6: Which IMPROVE algorithm was applied? Malm et. al (1994) or Pitchford et al., (2007)?
Page 9, line 10: Was site-specific Rayleigh used?
Page 9, line 14: How many IMPROVE sites were used and over what time periods?
Page 9, line 21: Do these SO_2 emission inventories include all sources?
Page 10, line 21: Does 'multi-year' correspond only to only the time period of the trend?
Page 10, line 30: Should "MK-Sen trends" actually be "MK-Sen slopes"?
Page 10, line 30: Clarification: The monthly 1/vis values are 75^{th} percentile (pg 6, line 28), but they are normalized by the monthly mean? Or a mean of the monthly 75^{th} percentile values over the trend time period?
Page 11, line 9-10: Does this mean that the data were actually interpolated? If so, using what technique?
Page 11, line 12: Could the authors clarify how the maximum number of grids is determined?
Page 11, line 20: Are the comparisons between monthly mean b_{ext} and 75^{th} percentile 1/vis?

Page 11, line 24: Over what years?
Page 11, line 25: The offset in the comparison shown in Figure A2 is likely due to Rayleigh scattering.
Page 13, lines 21- Page 14, line 23. Consider reordering this section and figures to streamline the discussion: Discuss/present Figure 5, followed by Figure 7, with the discussion in the text starting with the initial paragraph (pg 13, line 14-20), followed by (pg 13, line 30- pg 14, line7), followed by (pg 14, line 8-10), then (pg 13, line 21-29), followed by (pg 14, line 11-23).
Page 14, line 13: The opposite seasonality between Figure 6a and 6b could be associated with urban/rural differences, assuming most of the European sites are in cities?
Page 15, line 4: It would help to remind the reader here that the 89-96 map was shown in Figure 5.
Page 15, line 7: Point out that the range in trends represents more than one time period.
Page 15, line 25: SO_2 emissions in the western US are also much lower than in the East.
Page 18, line 19: Are SO_2 trends calculated over the same regions as 1/vis?
Page 18, line 26: While this section/paragraph is interesting and useful to include, I am not sure it warrants another section. Can it be blended into the discussion?
Page 18, line 32: Can the authors provide some quantification of "agrees well" ?
Page 20, line 27: Other species could also be contributing to these differences.
Page 21, line 11: I believe IMPROVE has an acknowledgement statement recommendation.

Technical corrections:

Page 1, line 21: Define b_{ext} at first usage (see line 23).
Page 1, line 27: Define EDGAR
Page 2, line 3: What is meant by "inferred" in this context?
Page 2, line 4: What is meant by "reconstructed" 1/vis?
Page 5, line 12: State that these are global observations and provide years.
Page 7, line 16: Please provide manufacturer information for the RHtest software.
Page 17, line 28: Define EANET
Page 17, line 32: Define MODIS, AOD

Comments on Figures

Figure 1: This figure is not necessary (see earlier comment).
Figure 2: What do the "0"s represent on the figure (under the dates)? Would these be dates for 'undetermined change' and '>95 insig change' if there were any?
Figure 4: Consider rearranging these figures to follow the discussion, with the mean b_{ext} on the top left, followed by the figures in order of the discussion. Include the time period in the caption.
Figure 5: The open-circle symbols are very difficult to see. Perhaps thicken the symbol line?
Figure 7: Same as figure 5.
Figure 8: Same as figure 5.
Figure 9: "Average monthly" still refers to the 75^{th} percentile? Adding symbols to the black line might help to show data gaps.
Figure 10: Adding the red boxes to all of the plots would help the eye to discern the divisions in the other time periods, especially with the high site density. Insignificant symbols are hard to see.
Figure 12: Same as Figure 10.
Figure A1: Typo on line 3 "visibility"
Figure A4: Insignificant symbols are hard to see.