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Atmospheric Chemistry and Physics Discussions



# *Interactive comment on* "Using measurements for evaluation of black carbon modeling" *by* S. Gilardoni et al.

**Anonymous Referee #2**

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This paper describes and quantifies some issues in the use of measured, surface black carbon concentrations to evaluate the fidelity of transport model simulations. It analyzes model and observational statistics in light of measurement uncertainty, and this approach should be more widely applied. These issues are frequently discussed when such evaluations are published, but in most papers they are only mentioned and not quantified. This paper raises the bar for these comparisons and I think it is an important contribution. I would like to see some of the points sharpened and synthesized before publication. My comments are given below.

General comment. I realize that it is common to divide a paper into "Method" and "Results" sections but I think this paper should be an exception. Section 2 describes the basic data used for the analysis. Statistical methods are discussed in the



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Model/observation comparison section. The sections could be renamed to reflect their content.

p 11319 "Systematic model evaluation has received an increasing attention..." I should hope that this is not true. There has always been attention to model evaluation but it gets more refined as time goes on.

Page 11319 line 18 and on. Representativeness is important, and interferences are important, but interferences don't make spatial and temporal representativeness more important. These are separate issues.

Authors should discuss why these particular stations were chosen for analysis. The selection is not obvious.

Section 2.1.1. There is a lengthy discussion about choices of correction for optical measurements. This is necessary as most data users don't recognize the importance of these assumptions, which are often made by the manufacturer or the measurement operator. However, I find it hard to synthesize and compare the data. I would like to see a table containing all these corrections: C, R(ATN) and sigma for each station. Perhaps this could be added to Table 1.

Page 11324 line 20. "Further validation was performed" Of what?

Page 11325, discussion of removal. Is information available on dominant removal (convective or stratiform)?

Page 11326: temporal representativeness. Good idea. I wish more models did this.

Page 11327: spatial representativeness. I don't think this section can really be interpreted as spatial representativeness. Two sets of observations within a single grid box may agree reasonably well. This is a necessary, but not a sufficient condition for an observation point to be representative. I suggest the section be retitled "Variability within a grid box" or something similar and the issue could be discussed.



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End of section 3: It would be useful to have a summary paragraph of the EBC and EC issue. It seems that EBC = BC in some regions but not where dust is present in large quantities. Please indicate which stations could be affected by dust and how you could determine this.

Section 4 General comment. This section discusses a few statistical tests. It would be nice to lead this section with an introduction to the tests that will be used, their value in analysis, and what the reader should look for in each test. Also compare these tests to each other during the discussion throughout. For example, what information do the results of the Mann-Whitney test provide, in contrast with the PD overlap? Authors may have become familiar with the physical interpretation of these measures through the course of their analysis, but most readers (and perhaps modelers) may not be so comfortable. Finally, finish the section with a concluding paragraph about what has been learned about the comparison at the different stations.

Section 4.2: variability. I like the idea of this section but found it hard to understand. The name "overall" variability for 1-hour data is confusing to me. Do the terms daily, diurnal, day-to-day mean the same thing? Perhaps frame this in terms of the Fast Fourier transform first so that you can discuss the frequency components.

Section 4.3: probability distributions and overlap. Again I like this idea but I am not sure what the presentation means. I do understand the statistical principle, but the physical implication is unclear. Since there are many reasons for model disagreement and agreement, I hope the authors can explore what a PD overlap means physically. If they can use it to explain the differences in model-measurement comparison at the various stations, it could be quite powerful.

Figures 5 and 7. Suggest you use different symbols in addition to colors, for readers who print in black and white or who have colorblindness.

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Interactive comment on Atmos. Chem. Phys. Discuss., 10, 11315, 2010.