Atmos. Chem. Phys. Discuss., 11, C6428–C6431, 2011
www.atmos-chem-phys-discuss.net/11/C6428/2011/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Using a mobile laboratory to characterize the distribution and transport of sulfur dioxide in and around Beijing" *by* M. Wang et al.

Anonymous Referee #2

Received and published: 14 July 2011

Review of "Using a Mobile Laboratory to Characterize the Distribution and Transport of Sulfur Dioxide in and Around Beijing" by Wang et al.

The paper reports on using a mobile lab to take SO2 measurements in and the Beijing area to estimate fluxes of SO2 in the immediate region. Measurements were taken from August-September, 2008, coinciding with the Olympics. The mobile-based measurements were supplemented by three ground based measurements. While the mobile and fixed-site instruments supplied the SO2 concentrations, trajectory, wind direction and speed information was supplied by running HYSPLIT and WRF. The two are combined to give SO2 fluxes. They found varying levels of sulfur fluxes in the region, as

one might expect. On the other hand, it was not apparent what was leading to specific changes in fluxes, particularly from the same region at different times.

Major comments:

My general concern with the paper is that they do not provide much context with their results. Is 1.56 kg/s a big flux? Does it make sense given the known/estimated emissions? How sensitive is the flux to the area chosen for assessment? Is this a level of concern for health or environmental reasons?

A second concern is that a number of assumptions are made in this analysis, e.g., uniformity of concentration and winds. Both are not correct to some degree, possibly a large degree. Given all of the likely errors, what is the overall error in any one calculation. This should be provided. For one, I think it would mean that one significant figure is likely enough.

Third (somewhat related to the first), the manuscript should provide a comparison of the expected SO2 fluxes (based on emissions) with the estimated fluxes.

Fourth, why does the estimated flux change with wind speed? They state it is due to changes in wind speed on observed SO2 concentration... though that is not the underlying reason, that is just how the calculation is done. The underlying reason would be something like: 1) There is an emissions change (huge, in this case), 2) A weakness in the calculation approach, 3) Errors in the measurements, 4) Errors in the modeling, or 5) A combination of those four and ones not identified. The paper should provide some insight as to what the reasons might be.

Overall, while the observations are of interest, the authors should provide more context and discuss what their analysis really means in terms of advancing the state of knowledge.

Additional comments:

They use “may”, “could” and other non-definitive answers. Remember, unless you go

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through the hypothesis testing to show those can't explain the results, it only says that the listed cause may be one of many. Little insight is provided. Provide some analysis that gives the reader confidence that the stated reason is a likely cause for the findings.

A rationale behind the choice of the five days modeled should be provided.

As noted above, there really is not reason to provide three significant figures on the results. Two might be pushing it.

What is "high standard" fuel.

You note the on-road measurements are used for two types of applications: examination of temporal/spatial trends and quantification of local and regional fluxes. There are more (exposures).

It I not apparent how the local turbulence influences the accuracy of measured data. Is the measurement accurate? If not, please explain why not.

They say they make two hypotheses... I think they mean assumptions. A more thorough analysis of the assumptions should be provided.

An API of over 100 does not imply adverse effects. The API is an scale chosen for communication and reflects some information about the severity of adverse effects. There is little question that adverse effects occur below this point. The government may find those effects reasonable. There is also little reason to bring in API's as being "in agreement" since the two may be based on different compounds. If you are going to use API, you should provide what, exactly, the values noted mean in terms of SO2.

Explain why it is obvious that SO2 on Sept. 4 was from the southern region... what about nearby?

What do you mean by the flux calculations being reasonable with acceptable uncertainty. What is reasonable and what is acceptable? The answers to these questions vary with use and individual. Please define or just be more specific and quantitative

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and do not give such a subjective evaluation.

Grammar is in need of improvement, e.g., plurals of words, articles, etc.,

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Interactive comment on Atmos. Chem. Phys. Discuss., 11, 16465, 2011.