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Atmospheric Measurement Techniques Discussions

Interactive comment on "Field test of available methods to measure remotely SO_2 and NO_x emissions from ships" *by* J. M. Balzani Lööv et al.

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This paper has been in open discussion for a very long time as one of the reviewers who originally agreed to provide a review in spite of several communications eventually failed to do so. A replacement reviewer who agreed to provide a fast review did not submit anything either and this combination lead to an inappropriately long delay in processing this manuscript. I would like to apologize for this delay and below provide my editor review in addition to the comment already uploaded by the first reviewer.

In their manuscript "Field test of available methods to measure remotely SOx and NOX emissions from ships", the authors report on results from the SIRENA-R campaign where a number of different remote methods to estimate sulphur fuel content and NOx

emissions from ship exhausts were evaluated in and close to the harbour of Rotterdam. The approaches compared include DOAS, lidar, a UV camera as well as conventional sniffing. In addition to comparison between methods, in-situ data from the stacks of one ship were also available, providing validation data. The paper introduces the need for ship emission measurements, briefly describes the campaign and the methods used and provides comparisons between many different measurements and estimates of FSC and NOx emissions. The results show good agreement in some cases and differences in many other situations, highlighting the difficulties of the measurements and proper comparisons. The main conclusion of the authors is that sniffing methods currently still are the best choice.

The paper is clearly written, well structured, and reports on relevant results from an interesting campaign. The topic fits well into the scope of AMT and the paper can be accepted for publication once the following suggestions and questions have been taken into account.

Comments:

- One of the main conclusions I draw from this paper is, that even with careful planning of a campaign like SIRENAS-R, it is difficult to come to clear conclusions for the comparisons. My suggestion is to summarise all the problems encountered in something like a “lessons learned” section including a brief discussion of co-alignment of measurement volumes, background subtraction problems, response time issues, the importance of auxiliary engines and manoeuvres and so on.
- Differences in response time are mentioned as an important issue for the difference between instruments. While I can see that it makes a difference how fast an instrument reacts on a short peak from a SO2 plume, I’m surprised to learn that this will also affect the value integrated over the peak. Can you please expand on this problem?

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- In Fig. 10, one (very nice) comparison is shown for DOAS and stack measurements. However, in the text and table it is mentioned, that on another occasion, the agreement was far poorer. I think it cannot be justified to just pick the good case for the figure and "hide" the bad case in a table. Either an explanation can be found for the difference or both cases should be displayed in the figure.
- Outliers have been removed in the correlation plots based on a standard deviation criterion. Please comment on the justification for doing so and possible reasons for outliers in the measurements.

Technical Points

- Throughout the paper (text and figures), units change between g/s and kg/hour. It would be good to harmonize this
- Figure 3: I do not see what this figure adds to the paper. If the key difference between the two methods (horizontal distance between plume and instrument) is to be demonstrated, I think a side view of the scene would be more useful.
- Figure 4 and 5: the legends are confusing – is "y = xx" the slope? Why do you include a point with the annotation "y". I'd suggest to remove or rename these labels
- Fig. 4 please use same scale for all three panels
- Fig. 4 and 5 please include 1:1 line
- page 9748, line 3: points downwards
- page 9748, line 5: why is the plume intersected twice – because of the flight pattern or because of the geometry (sun coming from the sun, through the plume, reflected on the ocean, back through the plume to the instrument)?

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- page 9748, line 26: what is bi-dimensional – is that 2-dimensional?
- page 9749, line 14: cause attenuation
- page 9749: add reference to Prata AMT 2014 paper, already here the aerosol problem should be mentioned and the lack of a second wavelength
- page 9751, line 14: it was not possible to
- page 9754, line 25/26: why do you call this an error – isn't that just a difference and we don't know which of the measurements is right?
- page 9756, line 13: Not clear to me what you mean with "caused by the plume and the background"
- page 9757, line 1 and 2: something is missing in this sentence
- page 9758, line 9: that has the same maximum
- page 9762, line 20: it proved
- page 9762, line 21: This is the consequence
- page 9763, line 2: it could be noted that the health impact might be largest for emissions in harbours
- page 9763, line 6: suggest

Interactive comment on Atmos. Meas. Tech. Discuss., 6, 9735, 2013.