Atmos. Meas. Tech. Discuss., 6, C2755–C2757, 2013
www.atmos-meas-tech-discuss.net/6/C2755/2013/

Atmospheric Measurement Techniques Discussions

Interactive comment on "Mobile measurements of ship emissions in two harbour areas in Finland" *by* L. Pirjola et al.

Anonymous Referee #2

Received and published: 30 September 2013

Pirjola et al. report in their paper emission factors (EF) for 11 individual ships equipped with different aftertreatment system, travelling at ports of Helsinki and Turku. The authors applied the plume catchment method performed from the shore by a mobile laboratory equipped by the necessary instruments, moving the van to the best measurement location determined by wind conditions. The number of papers on the related field increases, indicating the growing importance of ship emission on human health, air quality and climate worldwide. However, this work pursues the series of previous studies, the number of relevant citations is limited and the comparative analysis of the data is also incomplete. On the other hand, the paper concerns numerous important topics such as particle size distribution, volatility of the emitted aerosols, effects of aftertreatment systems, comparison between seasons, etc. For the above reasons I

suggest to accept the manuscript for publication after mayor revisions based on the following comments.

1. The reported data concern for SECA during an important period, namely after the reduction of fuel sulphur content (FSC) from 1.5% to 1%, and prior to further reduction from 1% to 0.1%. Even though, the presented work focuses mainly on the aerosol emission, the paper would document the effect of the FSC reduction, since particle emission and FSC are tightly related as previous works demonstrated. For this reason, I miss a detailed comparison with previous works done by SECA prior to the recent reduction of FSC. For example, whereas Alfoldy et al. (2013) published particle emission factor up to 5.7 10ˆ16 (kg fuel)ˆ-1, this paper reports particle EF below 2.26 10ˆ16 (kg fuel)ˆ-1, as an evident sign of the benefits of FSC reduction.

2. Authors found that the calculated FSCs are significantly lower than the actual limit at SECA (0,37% vs. 1%). They explain this difference in the first paragraph on page 7164 considering the contribution of the auxiliary engine emission that generally use low sulfur fuel. Authors should mention that same thing was found by previous studies (see e.g. Alfoldy et al., 2013). They should also enhance here that the reported EFs (for SO2 and particles) are biased due to the relatively significant contribution of auxiliary engines in ports comparing to the steady state engine operating conditions that is generally current at open sea.

3. Since one ship was measured twice or more times, statistical analysis would be beneficial for the evaluation of the repeatability of the measurements. Even though standard deviations of the results are given in the paper, no information can be found in the text how were they calculated. A new section regarding the uncertainty analysis of the measurements should be added to the text.

4. Fig. 6 is still not understandable. Authors briefly described in their reply how they generated the figure from the raw ELPI data, but they should do the same in the text, detailing how and which Matlab functions were applied. A relevant reference for the

AMTD

6, C2755–C2757, 2013

applied software is also required. Otherwise the original ELPI data should be presented here. It is a quite important point, since they haven't presented what they measured, but a modified figure was inserted instead.

References:

Alfoldy et al. (2013) Measurements of air pollution emission factors for marine transportation in SECA, Atmos. Meas. Tech. 6, 1777-1791.

Interactive comment on Atmos. Meas. Tech. Discuss., 6, 7149, 2013.