

## ***Interactive comment on* “Impact of the marine atmospheric boundary layer on VSLs abundances in the eastern tropical and subtropical North Atlantic Ocean” by S. Fuhlbrügge et al.**

### **Anonymous Referee #1**

Received and published: 22 January 2013

### Summary

This manuscript, entitled “Impact of the marine atmospheric boundary layer on VSLs abundances in the eastern tropical and subtropical North Atlantic Ocean”, presented by Fuhlbrügge and colleagues discussed how the marine boundary layer conditions influenced atmospheric abundances of VSLs during the DRIVE ship campaign. The authors reported the observed VSLs atmospheric mixing ratios, and utilized the atmospheric back trajectory model (Hysplit) to assess the influences of air mass origins. The authors also calculated correlations between the VSLs with different variables, such as wind speed and direction, air and seawater temperature, humidity, and boundary layer

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height, and attempted to assess the influences of these variables to VLSL atmospheric abundances. The key finding concluded by the authors was marine boundary layer height is significantly correlated with VLSL atmospheric abundances. Although such relationship has always been presumed to have an affect on trace gas atmospheric abundances, it is nice to see such nice relationship derived from data, which is rare for the VLSL. The data should be published, as more data are needed to better constrain the VLSL global budget. I would recommend publishing the manuscript after a major revision. Below I listed my general and detailed comments:

### General comments

The graphical presentation of the manuscript is satisfactory. However, the text presentation in the manuscript would need more effort to better convey the idea of the paper:

- (1) Grammatical errors were found in various places in the manuscript.
- (2) Discussion in many sections can probably be shortened. For example, sections discussing meteorology and marine boundary layer can be significantly shortened, as the main focus of the study is the VLSL.
- (3) In general, manuscript text should present the scientific information extracted from the figure but not discuss the figures themselves. Any specific reference to a specific colored line or panel should be referred to in the figure captions not the text.
- (4) Throughout the manuscript, the authors often refer to Hepach et al., 2012 for measurements in the seawater. However, it seems this manuscript is still under preparation, which is not appropriate to cite. Moreover, even if Hepach et al., 2012 is focusing on the seawater side of the story and it is understandable that the authors do not want to present overlap details in two places, certain aspects should still be included. For example, at least mention where and how the water samples were collected, since  $\Delta C$  was presented; e.g. collected from surface? X m below the surface? from the Niskin

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bottle? or from an equilibrator?

(5) The authors have made the effort to also examine the relationship between VSLs fluxes and marine boundary layer height, and concluded that seawater concentrations were actually the dominant driver for the fluxes. Then I would be surprised why not also compare the atmospheric abundances in the same fashion. While the boundary layer height is obviously influencing their atmospheric abundances, I am sure seawater sources must be to some degrees influencing their abundances in the atmosphere as well, as observed in many studies. I would think the authors should also include the seawater concentration influences and compare it with boundary layer height, in order to make a stronger case.

(6) Throughout the manuscript, the statistics should be presented with a p-value and number of samples (n).

(7) The title itself is a bit confusing, perhaps “impact of the marine boundary layer conditions. . .”

#### Specific comments

31206 Line 21. The “missing source” was not discussed in the manuscript, and what “missing source” do the authors refer to?

31208 Lines 15 to 20. I think this paragraph can be omitted.

31209 Line 1. Should read “. . .to investigate the diurnal. . .”

31209 Line 2. What does “mutual interaction between ocean and atmosphere” mean?

31209 Line 6. Transit between where?

31209 Line 24 to 26. This sentence sounded confusing, can the authors explicitly indicate the number of samples? For example, from “x” samples increased to “y” samples?

31210 Line 25 “lower meters of the boundary layer” sounded awkward; maybe “lower

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boundary layer”?

31212 section 3.1. This section can be shortened.

31212 Line 14. Is it typical to use “fresh” to describe windspeed? Maybe fast? Or did the authors mean the age of the air mass?

31213 section 3.1.1. This section can be shortened.

31216 Line 4. How do the authors define “coast”? From depth, nutrient, or primary production?

31216 Line 14. From here and onward, the authors reported the CH<sub>2</sub>Br<sub>2</sub>/CHBr<sub>3</sub> ratios in the atmosphere. What do these ratios imply during this expedition? Can any of the atmospheric processes or degradation of the compounds explain that? Simply reporting a ratio and not further discussing it does not seem useful or relevant.

31216 Line 25. Why should the VSLS increase at sunrise? Can such a finding relate to increase in seawater concentrations due to photosynthesis? Otherwise, I would be surprised to see an increase in the atmosphere because these compounds can be degraded through photolysis. Did a change in boundary layer height lead to such an apparent increase? 31217 Line 2. How do the authors identify outlier? Was any statistical criterion, such as greater than 2 standard deviations used?

31218 Line 8. I think this kind of description should be in the figure caption.

31218 Line 18. I cannot find a description about what the color means in the manuscript or the figures. Do the blue, yellow, and orange mean different initial altitude for running the Hysplit model?

31222 Line 20. Maybe also due to CH<sub>3</sub>I lifetime in the atmosphere?

31223 The summary is somewhat redundant, much information already included in the introduction. I recommend maybe shorten to only include the key findings of the study.

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Table 3. Please include p-values and number of samples (n).

Table 4. Although much of the information was already mentioned in the table 3 caption, it should still be mentioned again. Each table and figure should be self contained.

Figures 8 and 9. Detailed figure captions are needed, see above.

Figure 10. Please include a description about the colored trajectory.

Figure 12. Please also include p-values.

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Interactive comment on Atmos. Chem. Phys. Discuss., 12, 31205, 2012.

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