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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Constraining the concentration of the hydroxyl radical in a stratocumulus-topped marine boundary layer from sea-to-air eddy covariance flux measurements of dimethylsulfide" *by* M. Yang et al.

Anonymous Referee #1

Received and published: 6 October 2009

General comments: This paper presents a unique and innovative method for determination of hydroxyl in the marine boundary layer. The authors are to be commended for bringing forward a potentially powerful approach for determination of boundary layer concentrations of chemically-important species. Overall, the paper is well-written and presents the work in a concise and effective manner.

The approach relies heavily on the stationarity of the VOCALS region, and thus cau-

tions should be expressed in the manuscript as to the narrow applicability of the approach. Previous comments by reviewer Faloona have pointed out that the major weakness of the paper is that the analysis has been integrated across extremely large time and spatial scales. It may be possible to make the approach more robust by including the direct measurements of MBL height time series from ship-based radiosondes and with the inclusion of time series of wind statistics. The authors should explore more thoroughly an analysis to determine the OH concentration on shorter time and spatial scales.

Specific comments: Abstract

Use of the term 'robust' is a bit too strong for this technique. Only under the near-ideal environmental circumstances such as in the VOCALS region could one use this approach. Suggest use of an adjective such as 'effective' in this context.

2.1 Surface flux of DMS

The wind direction history is critically important in your work, and I suggest that you include time series to demonstrate the predominance of open ocean winds in the region.

Also, I agree with the review of Faloona that demonstration of the VOCALS region with a map (schematically showing predominant wind direction, gradient of the surface DMS concentration, etc) will be illustrative.

2.2 Boundary layer structure

From the VOCALS website, it appears that there were regular radiosondings from the ship. The profiles from the radiosondes will show boundary layer depth most effectively, and these data should be used in your analysis. The C-130 data are not sufficient, particularly when you have readily-available T/RH profiles every 6 hours. This will impact Figures 4-7. It may be possible to extend the analysis to develop an OH concentration time-series, as opposed to developing a composite diurnal concentration of OH for the 5 week period.

2.3 Advective flux of DMS

The designation ‘DMS’ in the text should be more clear whether it is the surface value, measured value, marine boundary-layer concentration, etc. For example, in the first couple of paragraphs of this section, it is mentioned that ‘DMS is patchy’, and that you are estimating the ‘advective flux of DMS’, which presents a degree of ambiguity. Suggest you be more specific.

Suggest you show the result of the lat/long regression of the DMS concentrations on a map.

2.4 Entrainment velocity

Again, there is some ambiguity as to whether the term ‘DMS’ refers to the surface concentration, near-surface atmospheric value, boundary-layer top value, etc. This is true for the legends in the figures (for example, in Figure 5, is this the 18-m DMS concentration, integrated through the BL, etc?).

2.5 Estimating effective OH

What does it mean to have a ‘mean MBL temperature’ of 13 degC? The BL profile of temperature is non-trivial and impacts the interpretation and relative weight applied to either Equation 1 or 2. An explanation should be made as to the importance of water vapor here. Again, BL heights from radiosondes will be instrumental here. The discussion of relative error is important here, and I suggest that this be extended to develop error ranges for the final result (such as Figure 7).

3.1 Diel variability of OH

Suggest addition of the word ‘of’ between ‘amount’ and ‘shortwave’.

4 Conclusions

Replace the word ‘relative’ with ‘relatively’.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 16267, 2009.