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Atmospheric Measurement Techniques Discussions

Interactive comment on "Determination of oceanic ozone deposition by ship-borne eddy covariance flux measurements" *by* L. Bariteau et al.

Anonymous Referee #1

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General comments: This is a very detailed and thorough description of an eddy covariance technique for measuring ozone deposition on ship platforms. The authors are very meticulous in their description and analysis of the data. There is nothing necessarily new in either the ozone instrumentation or in the analysis of the eddy covariance flux data; it is just done very well and extremely carefully. This concern for detail is necessary to obtain quality ship-borne ozone flux measurements since the fluxes tend to be very small and can be overwhelmed by improper corrections or biases introduced by ship motions, etc. It is well-written and the figures adequately convey the authors' points. This paper merits publication with only a few minor considerations.

Specific Comments:

(1) Page 1942, section on Lag Time. During the TexAQS campaign, the authors ob-

served an increase in lag time within their inlet tubing as the inlet filter became increasingly clogged. Is there any evidence for loss of ozone on the dirty filter (or perhaps a dampening of the ozone fluctuations?). I would be more concerned with this aspect of the contamination build-up on the inlet filter than with the changing lag time - which they show has only a relatively small (+/- 6%) effect on their fluxes.

(2) Page 1950. The authors make the statement (in two different places) that an increase in the mean ozone flux leads to a decrease in the deposition velocity. This may only be in the semantics or definition of what an "increase" is – but intuition would suggest "an increase in the mean ozone flux" would be a flux of larger magnitude (for deposition - a larger negative flux with respect to the atmosphere). This would mean a larger deposition velocity (Vd(z) = -Flux/Concentration). I would also note that nowhere in this paper is the deposition velocity defined and it should also be noted that the Vd is defined at the measurement height (Vd is a function of height).

(3) Flux corrections for water vapor fluctuations are always problematic, especially in oceanic measurements, and I commend the authors for their detailed approach to this problem, but a few more aspects need to be mentioned:

a. From the description on page 1950, the authors use the fast H2O vapor measurements from the open path hygrometer to apply point-to-point density corrections of the ozone density for water vapor. However, this assumes that the lag time for H2O vapor and ozone in their inlet line is the same. That is not always the case – it is often observed that lag times for H2O are often 0.1-0.2 sec delayed from other scalars such as CO2. While this is likely a relatively small effect, it may be worth varying the H2O lag time by a few samples to quantitate this possible effect. Otherwise, the density correction can also be applied to the calculated covariance directly (not correcting each ozone density measurement individually) using the water vapor flux (see Webb et al., 1980 reference).

b. The addition of the Nafion dryer appears to be a nice way to reduce the water vapor corrections to the flux; however, there is no mention of whether there is a loss of ozone in the dryer or a dampening of the ozone fluctuations (which are the basis of the flux calculation). Ozone power spectra with and without the dryer may be a good addition to the Supplement (along with the shown water vapor spectra) and some mention of the ozone loss (or lack thereof) in the dryer.

(4) Figure 14. A better representation of the variance spectrum may be obtained by multiplying the spectral density (y-axis) by frequency. This allows the reader to clearly see the falloff curve at high frequencies typical of atmospheric turbulence and the frequency where white noise becomes important (indicated by a slope of +1).

Interactive comment on Atmos. Meas. Tech. Discuss., 2, 1933, 2009.