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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Air–sea fluxes of oxygenated volatile organic compounds across the Atlantic Ocean" *by* M. Yang et al.

Anonymous Referee #1

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Air–sea fluxes of oxygenated volatile organic compounds across the Atlantic Ocean M. Yang, R. Beale, P. Liss, M. Johnson, B. Blomquist, and P. Nightingale

Acetone, acetaldehyde, and methanol concentrations were measured in air and seawater during the Atlantic Meridional Transect cruise in 2012 from the UK to Chile (49N to 39S). The AMT cruise was also equipped to measure fluxes of these species across the air-sea interface via the Eddie-Covariance (EC) technique utilizing a PTR-MS instrument. These flux measurements are compared with estimates of air-sea exchange using film models as well as previously published data. A somewhat identical experiment along the same track also occurred in 2009 but did not include direct flux measurements. These OVOC are important components of the atmosphere and a quantitative understanding of their oceanic source-sink relationship remains poorly understood. In

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Discussion Paper

that sense the manuscript adds valuable information and should be published.

The paper adds little that is fundamentally new knowledge but direct flux measurements are novel. Papers previously published by these authors (Beale et al., 2013; Yang et al., 2013b) also cover much of the same ground. There are many measurement issues (interferences & detection limits) that are discussed here and there but hard to fully understand. There is little insight offered when large disagreement between EC flux and film models is observed (e. g. acetaldehyde). The paper should be shortened and reorganized to make it easier to read and understand. Here are some suggestions:

- Introduction is somewhat randomly organized with limited references and discusses many numbers from the literature that are hard to keep track of. Suggest creating a table that summarizes these data from literature and discuss briefly. In fact such an approach is used by your co-author in Beale et al (2013; Table 3) that contains much of the information being discussed here. The verbiage in the last paragraph about PTR-MS can be handled via citations as this is a commonly used instrument much discussed already by your group and others.

- A key issue is the PTR-MS detection sensitivity and role of interferences. 2-min average detection limits for acetone, acetaldehyde and methanol of 0.02, 0.02, and 0.05 ppb are provided (Page 8021-Line 27). However the EC data used is much higher resolution. What are the detection limit for 1-s or 10-s resolution? It could be that the entire analysis of acetaldehyde is faulty for lack of a suitable measurement sensitivity on top of unstable standards. Could this be the main reason why EC flux and film model estimate disagree so much? Was there any ozone interference for acetaldehyde as has been previously reported by others? Was O3 measured? Suggest that you discuss the issue of "sensitivity and interferences" for your molecules of interest in a single place and not have it scattered all over.

- Much is made of the difference between the use of H and H* for acetaldehyde (Page

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8031-8032 & Fig 8). This should be stated in one sentence in the text. It has been known for 30 years that the correct thing to use here is H*. Unnecessary use of H mainly causes confusion but adds little new information.

- The fact that the experiment was done in 2012 only appears once in the abstract. Add dates and lat-long info in Page 8019 (top para). Also add year in Fig 1.

-Page 8017-Line 7: Singh et al. (2003)

- Page 8046-Line 6: Singh, H.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 8015, 2014.