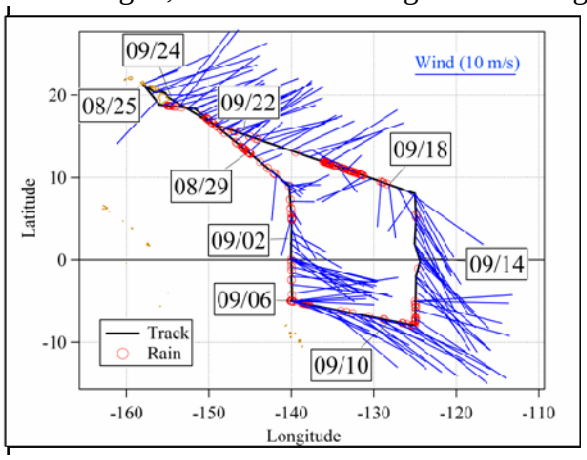
Responses to Reviewer #1

Please see the itemized responses to the reviewer's concerns (in bold text) below. Additions/corrections to a revised version of the manuscript are shown in italicized font.

p. 16901 line 15: The DMA was operated in a scanning mode, with an upscan time of 60 seconds. The inversions were done using a LabView program written by J. Zhou and described in his dissertation (Zhou, J., Hygroscopic properties of atmospheric aerosol particles in various environments, Ph.D. thesis, 166 pp., ISBN 91-7874-120-3, LUTFD2/(TFKF-1025)/1-166/(2001), Lund University, Lund, Sweden, 2001.) To clarify this the authors have added the following sentence to the description of the LDMA (page 16901, line 15): "*The LDMA was operated in a scanning mode, with an upscan time of 60 s. The inversions were done using a LabView program written by J. Zhou and described in his dissertation (Zhou, 2001).*"

p. 16903 line 25: Fig. 4. The wind lines are pointing into the wind (indicate direction wind had come from), and the length is proportional to speed. Author added an explanation in the caption on Fig. 4, and a wind bar legend to the figure (see below).



p. 16904 line 16-18. CO is also produced by VOC oxidation. To clarify this point we added the following sentence to the discussion of CO: "*While the ocean can be considered a source of CO to the atmosphere (Khalil and Rasmussen, 1990), it is more often used as a tracer sensitive tracer for the transport of pollution (Staudt et al., 2001).*"

Added the following reference:

Khalil, M.A.K. and Rasmussen, R.A.: The global cycle of carbon monoxide: Trends and mass balance, Chemosphere, 20, 227-242, 1990.

p. 16904 lines 23-25: The value of 2 ng m^{-3} was chosen because at that concentration, there appeared to be no relationship between SO_4 and BC (Fig. 5). The SO_4 there is likely to be of marine origin, so any correlation with Org may represent Org with a similar marine origin. The criteria of 56.5 ppbv CO was chosen because it represented the value that selected (i.e., reduced the data set to) the "low CO branch" of the SO_4 vs

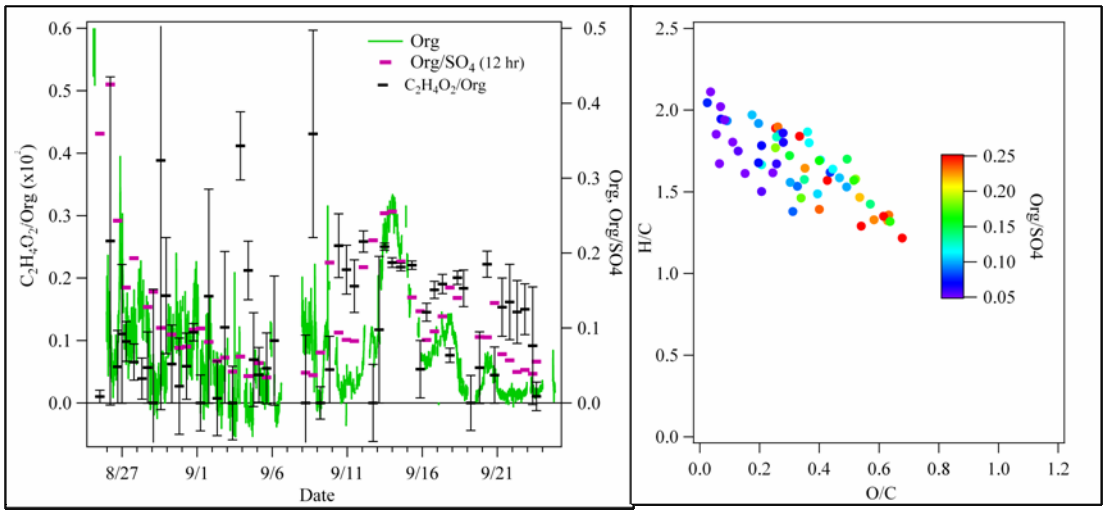
BC relationship mentioned on page 16905, lines 16-18 and illustrated in Fig 5d. In order to clarify this point, the following changes were made to page 16906, lines 15-19 were modified to: "*In an environment completely free of combustion influence, there should be no BC. A value of 2 ng m^{-3} BC was chosen because at that concentration there appears to be no relationship between SO_4 and BC (Fig. 5). Therefore, this SO_4 is likely to be of marine origin, so any correlation with Org may represent Org with a similar marine origin. Below 2 ng m^{-3} BC, and at a concentration of CO which highlights the low CO branch of the SO_4 versus BC relationship (determined to be 56.5 ppb), the natural variability in marine SO_4 is represented (Fig. 5d), i.e., SO_4 varies from 0.05-.5 μg m^{-3} (average 0.14 ± 0.11) while CO and BC remain essentially constant. Therefore, SO_4 and Org were further restricted to these values (CO < 56.5 ppb and BC < 2 ng m^{-3}) to more closely examine this low CO branch (dark blue circles in Fig. 20d) of the SO_4 vs Org relationship.*" No additional VOC measurements are available. Uncertainty ranges for the current study have been added to Table 1.

p. 16905 line 28: The authors are referring to total non-refractory submicron mass, this was clarified in the text by editing the sentence in question to: "… *while SO_4 constitutes 87% of the total submicron non-refractory mass in the MBL.*"

p. 16906 line 5: The slopes of all studies, other than the current study, are implied slopes based on reported averages of Org and SO_4 from other studies (as mentioned in the figure caption on page 16925). The data used to generate slopes in Fig. 3 is presented in Table 1. Uncertainty values were added to the table where available (some of the previous studies do not report uncertainties with their averages.) This plot is intended to show the range of values observed, for both numerator (Org) and denominator (SO_4). It reveals large differences present in different regions as well as clustering along a given slope (ratio). These differences are not a direct reflection of the sources but they do reveal characteristics of different air masses and illustrate the variability over various data sets. As variations in this ratio can be expected in response to both natural and combustion derived processes, presenting the data in this fashion seems warranted and useful.

p. 16908 line 9. Yes, the "signal to noise level" is lower for the $C_2H_4O_2$ fragments. The sentence has been changed to: *"Because the signal to noise level is lower for the $C_2H_4O_2$ peak, error bars (1σ) are shown as well."*

p. 16908 line 12. We have changed Fig. 8 to show the $C_2H_4O_2$/Org mass fraction, rather than absolute concentration of the fragment (see updated figure below).



p. 16912 line 4. The authors are referring to the IMPEX "clean Org/SO_4 ratio" in this case. To clarify sentence was changed to: "*The clean Org/SO_4 ratio that was observed during IMPEX is significantly lower than other clean air studies in the north Pacific…*"

Answers to technical corrections:

p. 16900 line 25 replace "frag" with "fragmentation"

'frag' was replaced with 'fragmentation', the sentence is now: *"The fragmentation table in SQUIRREL was adjusted to give zero Org mass concentrations during filter periods."*

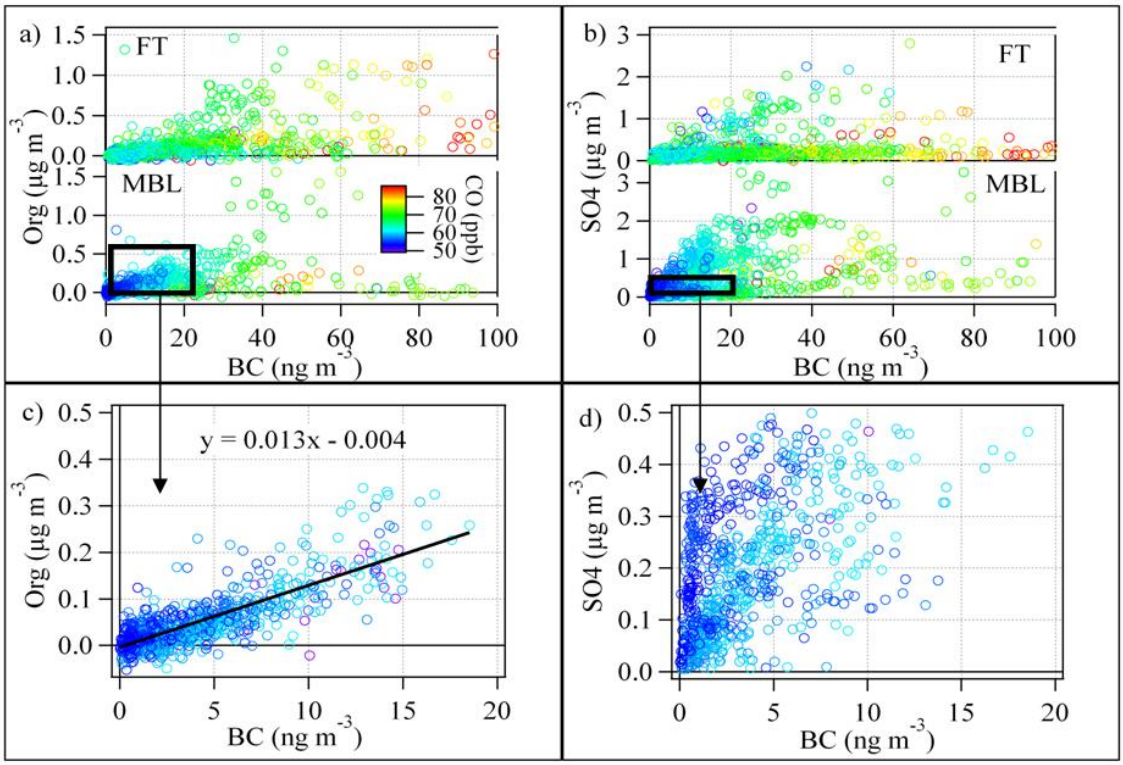
p. 16900 line 28 subscript the "4" in "NH4"

The '4' in NH4 was subscripted: *"The CE of the AMS for the inorganic ions was estimated by comparing the molar ratio of NH_4 to SO_4 to determine the acidity of the aerosol."*

p. 16918 line 10, change to "air-sea interface"

Reference was changed to:
Keene, W. C., Maring, H., Maben, J. R., Kieber, D. J., Pszenny, A. A. P., Dahl, E. E., Izaguirre, M. A., Davis, A. J., Long, M. S., Zhou, X., Smoydzin, L., Sander, R.: Chemical and physical characteristics of nascent aerosols produced by bursting bubbles at a model air-sea interface, J. Geophys. Res., 112, D21202, doi:10.1029/2007JD008464, 2007.

p. 16927, fig. 5a. The aspect ratio is poor, the colors faint, and the symbols are hard to read because the symbol size/line thickness is too small.
See updated figure below


a)
FT
MBL
Org (µg m-3)
CO (ppb)
80
70
60
50
BC (ng m-3)
b)
FT
MBL
SO4 (µg m-3)
BC (ng m-3)
c)
y = 0.013x - 0.004
Org (µg m-3)
BC (ng m-3)
d)
SO4 (µg m-3)
BC (ng m-3)