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Interactive comment on “Organic molecular composition of marine aerosols over the Arctic Ocean in summer: contributions of primary emission and secondary aerosol formation” by P. Q. Fu et al.

Anonymous Referee #2

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This manuscript presents ambient concentrations of numerous organic compounds measured in marine aerosol particles, as well as a discussion of their possible origins and interrelations. Aside from the major homologous series of hydrocarbons, several molecular source tracers were quantified for the assessment of contributions from different emission sources, such as bioaerosol, biomass burning, and secondary organic aerosol (SOA). Primary biological aerosol in form of fungal spores and biogenic SOA from isoprene and pinene oxidation were shown to have important influence on the marine arctic aerosol burden.

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The findings from this study are valuable, since few measurements of speciated organic aerosol have been reported for marine and in particular arctic regions. The manuscript is well written, except for some grammar and spelling mistakes, and the interpretation of the presented data is reasonable. Therefore, I recommend publication of this manuscript in Biogeosciences after considering and incorporating the comments and suggestions presented below.

Specific comments

1. Page 10433, lines 20-21: Was only one field blank collected during the entire cruise? As the authors may agree, that is not sufficient, especially during difficult sampling conditions, such as these on board of a ship. The resulting blank concentrations have, thus, no statistical basis. However, lab blanks were apparently used for blank corrections as well, which compensate at least partially for the lack of field blanks.

2. Page 10435, lines 9-11: When using the Sunset carbon analyzer, usually the NIOSH protocol (or modification thereof) is used rather than the IMPROVE method, involving thermo-optical reflectance (TOR) measurement. Please, clarify which method was really used (especially in terms of the optical charring correction) and include a reference for the method, as this is very important for comparisons of the resulting OC and EC data with those from other studies.

3. Page 10440, lines 16-25: The authors mention several possible sources of fatty alcohols in general, but don't provide a discussion of the specific sources that may have influenced the marine aerosol in this study. For instance, biomass burning was not even an important emission source of the carbonaceous marine aerosol (as stated in the previous section), yet the authors mention it here as a possible source. It would, therefore, be more meaningful to discuss the most likely sources that influenced the marine aerosol on specific days, depending on the air mass history, as they do with other compound classes.

4. Page 10441, lines 17-24: It is interesting to see the good correlation between man-

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nitol and ergosterol, which has not been observed in previous studies. On the other hand, the poor correlation between arabitol and mannitol is surprising, as it has been found to be high in several other studies, such as Zhang et al., (2010a). The authors give a good explanation, though, i.e., the influence of diverse fungal sources, as the contributions are not local but due to long-range transport of fungal spores from terrestrial regions.

5. Page 10446, lines 25-28: As the data presented in this section are not an actual source apportionment, it would be helpful if the authors added a statement that describes the calculation method (i.e., how the percentage values were obtained) and, thus, avoids confusion with typical source apportionment results, such as those obtained by CMB modeling.

Technical corrections:

1. Throughout the entire manuscript, the symbol for liters needs to be corrected, i.e., write "L" instead of "l". Also, the grammar and spelling need to be checked preferentially by a native English speaker and corrected throughout the manuscript.
2. Page 10436, line 24: Please, add "e.g." before the reference, as this is only one of many possible studies which could be cited here.
3. Page 10437, lines 1-5: The authors may also want to compare their OC/EC data with those from another recent study of marine aerosols conducted during two cruises in the Atlantic Ocean and Pacific Ocean (Zhang et al., 2010b).
4. Page 10441, line 3: Change "innumerous" to "numerous".
5. Page 10441, line 14: There is a typo in the author name "Burshtain" – it should be "Burshtein".

References:

1. Zhang et al., ERL, 5, doi:10.1088/1748-9326/5/2/024010, 2010a

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2. Zhang et al., JGR, 115, D22302, doi:10.1029/2010JD014246, 2010b

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