Response to the reviewer's comments

Anonymous Referee #1
Received and published: 13 January 2012

General comments:
Dust storm from Asia has been given much attention with most focusing on inorganic components such as sulfate, nitrate and elements. However, impact of dust storm on the downwind organic aerosols has not been considered. This paper addressed the influence of dust storm on organic aerosols in the downstream atmospheres including molecular composition and size distribution, which is very important for readers to improve their understanding on the characteristics of Asian dust storm and its impact on the downwind aerosol chemistry. The observation results in this paper from the Mt. Hua and Mt. Tai are very interesting and unique. The paper is organized well, tables and figures are clearly presented and related discussions are adequate and reasonable. Thus, I recommend an acceptance of this paper for publication in the journal after a minor revision. Detailed comments are given below.
Response:
We thank the reviewer's comments above and revised our paper according to the comments below.

Detailed comments:
Comments:
1) Page 33545, line 8-9, the abstract section, based on the results and related discussions presented in this paper, here I think plants in the Gobi sandy desert are the source of the high level of organic aerosols found in the mountain samples during the dust storm event. Biogenic sources not only include plants but also mean other biota sources in soil such as invertebrates, bacteria and fungi. Molecular compositions of compounds (i.e., HMW n-alkanes, and fatty acids and alcohols) in the samples clearly indicate that organic matter in the dust samples were largely derived from the Gobi desert plants. Therefore, I think the related statement should be revised.
Response: Suggestion taken. See the revised manuscript at page 2, line 40-41.

Comments:
2) Page 33545, lines 14-17. These findings are very interesting. In the past decades scientists have used Ca/Ca2+ as a tracer for investigation of dust storm, but it is hard to distinguish the local soil derived particles from the dust. Trehalose, as recommended by the authors, is probably a new tracer for dust plumes originating from the dry Gobi region. In addition, the conclusion about PAH sources is also very interesting, because the current work demonstrates that pollution from coal burning in China is still the major problem resulting in the poor air quality, although vehicle emissions in China has sharply increased.
Response: We thank the reviewer's comments above.

Comments:
3) Page 33549, line 25, using "were" not "are".
4) Page 33553, line 15, "from" not "form";
Response: Suggestion taken. See page 6, line 160, and page 10, line 252, respectively.

Comments
5) Page 33554, lines 18-22, what kind of formation pathways? Is it an in-cloud formation and/or aqueous-phase oxidation? Could the authors give more explanation?
Response: Suggestion taken. We added "an in-cloud formation " into the text, see page 11, line 280-281.

Comments
6) Page 33557, line 3, "grow" not "grows"; line 14, "naphthalene" not "naphthalen"
Response: We corrected the typing mistakes. See page 13, lines 340 and 350.

Comments
7) Page 33558, line 27, here should be aerosols not aerosol.
8) Page 33560, lines 3-16, I think these statements would be more accurate if using past tense.
Response: Suggestion taken. See page 15, line 388, and page 15-16, line 410-429, respectively.

Anonymous Referee #2

General Comments:
This paper describes the concentration of organic compounds in aerosol particles collected at two mountain sites, Mt. Hua and Mt Tai in China. Authors discuss the concentration and size distribution of n-alkanes, PAHs, fatty acids, fatty alcohols, sugars, aromatic and diacids during dust event and nonevent occurred at both of the sites. Paper is nicely described the concentration variations of these compounds at both of the mountain sites as well as their changes in size distribution during the dust and non dust period. I recommend for the acceptance of the paper.
Positive sides:
1. Very unique information of these compounds during dust event and nonevent.
2. Discussion of shifting of peak of size distribution of organic compounds especially for PAHs
3. Proposing trehalose as tracer for dust aerosols
Response: We thank the reviewer's comments.

Comments:
Negative sides:
Not many evidences are given for trehalose to declare it as tracer for dust aerosols over Ca.
Response: We agree with the reviewer's comment above. Since in the current stage we do not have additional evidence, we modified our statement (see details below).

Detailed Comments:
Comments:
1) Para 33543, Abstract, L5, "polarization" may change to "splitting" or "shifting".
Response: Suggestion taken. See page 3, line 64.

Comments:
2) Introduction, Para 33546, L5, "– the highest in the word", very strong statement!
Response: Suggestion taken. We re-wrote the sentences, see page 4, line 96-99.

Comments:
3) Para 33549, 3.1.1 n-alkanes, fatty acids and fatty alcohols, L25, "— –from plants in Gobi region." Please write a reference value of Gobi aerosol if available.
Response: Suggestion taken. See page 7, line 183.

Comments:
3) 3.1.2 PAHs and sugars, Para 33551, L 25-5, "The more LMW PAHs in the —- — - -to lowland regions." Logic is not very clear!
Response: Suggestion taken. We re-wrote the sentences to clarify our statements, see page 8, line 212-217.

Comments:
4) Para 33551-33552, L25, "Ca and Ca2+ are —-. ——. —. —and sandy lands in Gobi." It needs more evidences for support, such as correlation between nssCa and trehalose, and also between (nssCa - soil derived Ca) and trehalose. Soil derived Ca can be calculated using some soil originated metals such as Al.
Response: We agree with the above comments. Unfortunately, we did measure the elements such as Al and Ca in the samples, thus in the current stage we cannot give more additional evidences. Therefore, we revised the related statements throughout the paper. See page 2, line 45-48, and page 9, line 242-243.

Comments:
5) 3.1.3 aromatic acids and diacids Para33551, L25, "aomatic" ?
Response: We corrected the mistake. See page 10, line 263.

Comments:
6) Para 33553, L10-15, "— , indicating that —those at Mt. Tai." Needs more justification.
Response: We re-wrote the sentences. See page 10, line 275-278.

Comments:
7) Para 33554, 3.2 Size distribution, L15, "some references such as Agarwal et al., ACP, 10, 5839-58, 2010 can be added."
Response: Suggestion taken. See page 13, line 352.

Comments:
8) Fig. 9-10: Font size is very small, difficult to read.
Response: The figure sizes in the web version of the paper were reduced, but the manuscript version sizes are big enough for reading.

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Comments:
This is a very interesting paper. I am particularly interested in the author's finding that suggests that LMW PAHs revolatilize and redistribute bimodally onto dust particles, and their finding that in contrast, HMW PAHs stay in the fine mode. This does speak strongly for their case that organics are able to deposit onto dust surfaces.
As further support for this finding, the authors might be interested in a recent study in the North Atlantic. In Zamora et al., 2011, we found evidence that aerosol water soluble organic nitrogen compounds were capable of adsorbing or depositing onto Saharan dust particles. However, we did not look at the actual individual species or mechanisms involved.

Reference: Zamora, L. M., J. M. Prospero, and D. A. Hansell (2011), Organic nitrogen in aerosols and precipitation at Barbados and Miami: Implications regarding sources, transport and deposition to the western subtropical North Atlantic, J. Geophys. Res., 116, D20309, doi:10.1029/2011JD015660.

Response: We thank Dr. Zamora's comments above, and added the paper as a reference into the revised paper for supporting our work.