

***Interactive comment on “Summertime contributions of isoprene, monoterpenes, and sesquiterpene oxidation to the formation of secondary organic aerosol in the troposphere over Mt. Tai, Central East China during MTX2006” by P. Q. Fu et al.***

**Anonymous Referee #3**

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General comments:

This paper provides the data regarding the biogenic SOA tracers of isoprene, monoterpenes, and  $\beta$ -caryophyllene oxidation products in high mountain regions of Central East China in early summer. In addition, the temporal variations, possible sources, relationship with other species (OH, O<sub>3</sub>, NO<sub>x</sub>) as well as the reasons of enhanced contribution of isoprene oxidation products are further investigated in this study. The

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study is valuable for more understanding of the contribution of biogenic volatile organic compounds to the secondary organic aerosol (SOA) in high mountain regions. Nevertheless, the main thrust of this paper is to use observation data to draw conclusions on the contribution of SOC derived from biogenic volatile organic compounds to organic carbon (OC). The quantitative determinations and calibration of these biogenic SOA tracers plays a decisive role for the results. In this study, many biogenic tracers were estimated by using the response factors of surrogates due to the lack of authentic standards. It's hard to convince the readers of the results discussed in the paper. Furthermore, this paper also has many controversial discussions, inferences and conclusions, which are not clearly expressed and not supported by substantial evidences (see specific comments). These shortcomings need to revise. In my opinion, the results presented for high mountain region of Central East China is valuable and could be considered for publication after the specific comments below have been carefully addressed, especially for quantitative determinations.

Specific comments:

Page 16944 Lines 10-11: Monoterpenes..., global model estimates about 12-70Tg /yr, Hallquist et al., ACP, 9, 5155-5236, 2009, has updated estimation.

Page 16945 Lines 2-6: The sampling site on Mt. Tai above or under PBL may affect the nighttime results presented in this study. How do the authors distinguish that the sampling site on Mt. Tai is above or under PBL in the nighttime? Could the authors provide which periods the site existed in the free troposphere?

Page 16946: With regard to quality assurance of SOC tracer analysis, I suggest the authors should add more statements (e. g. interlab comparison or more quality assurance of SOC tracer analysis) to strengthen the reliability of data.

Page 16950 Lines 15-28: A suggestion for this paragraph. It would be better to have other measurements of radiation or aging indicators to support the lower degree of photochemical process during 8–10 June.

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Page 16951 Lines 4-7: The fair correlation ( $R^2=0.52$ ) between levoglucosan and  $\beta$ -caryophyllene oxidation products is insufficient to support that  $\beta$ -caryophyllinic acid detected over Mt. Tai was mainly originated from biomass burning process in early summer. Those two compounds may be derived from same source regions and/or have similar atmospheric transport. This statement needs to be made with caution.

Page 16951 Lines 10-12: It needs some references to support that burning of wheat straws in field or lab experiments releases levoglucosan and sesquiterpenes such as  $\beta$ -caryophyllene to a certain quantity. In addition, it also needs some references to support the statement "Forest fires enhance the emissions of BVOCs" on Page 16951 Line 23.

Page 16952 Lines 3-4: It would be better to further interpret why 3-HG, a SOA tracer of monoterpene, had good correlation with malic acid and belonged to cluster 1 (emissions from biomass burning).

Page 16953 Lines 17-18: Do the authors mean that the isoprene oxidation products are more abundant than "other biogenic SOA precursors" or "other biogenic SOA"?

Page 16954 Lines 2-5: The unit of concentration should be mentioned here, is it  $\mu\text{g}/\text{m}^3$  or  $\mu\text{gC}/\text{m}^3$ ? In addition, authors should more clearly explain why the atmospheric concentrations of isoprene over Mt. Tai about twice higher than those of pinene indicates that both of them (especially isoprene) were not completely oxidized during the transport from their ground sources to the summit of Mt. Tai. Were isoprene and piene all from the ground sources? Furthermore, why especially for isoprene?

Page 16954 Lines 6-11: In addition to the influence of temperature on gas/particle partitioning, some other factors could also affect Riso/mono at daytime and nighttime, such as humidity, and the sampling site above or under PBL. It would be more considerate to taking into all these factors account.

Page 16954 Lines 14-15 and Fig.5: It is difficult based on Fig.5 to detect that higher

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Riso/mono values are observed when O<sub>3</sub> and NO<sub>x</sub> concentrations are higher. The correlation coefficients should be mentioned in the text.

Page 16954 Line 27-Page 16955 Line 6: The cloud processing needs to be interpreted. In this paragraph, I cannot find why high NO<sub>x</sub> supported the enhanced contribution of isoprene oxidation products.

Page 16957 Lines 6-11: Please specify why high levels of pollutants enhance the SOA formation rates. It is not mentioned in the text. In addition, the next conclusions (P16957, L25 - P16958, L3) are also not mentioned or discussed in the text.

Page 16958 Lines 3-7: The authors concluded that the high isoprene-derived SOA observed in the high altitudinal aerosols over Mt. Tai is consistent with previous findings from aircraft observation that very high OC values over Northwest Pacific during the ACE-Asia campaign. Did the ACE-Asia campaign also find high isoprene-derived SOA over Mt. Tai?

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Interactive comment on Atmos. Chem. Phys. Discuss., 9, 16941, 2009.

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