Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2018-693-RC1, 2018

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Molecular characterization of organic aerosol in Himalayas: insight from ultra-high resolution mass spectrometry" *by* Yanqing An et al.

Anonymous Referee #1

Received and published: 4 September 2018

This study analyzed the molecular chemical composition of water soluble organic matter (WSOM) from two fine particulate filter samples collected at a high altitude station (Qomolangma Station, QOMS, 4276 m a.s.l.) in the northern Himalayas using positive mode electrospray ionization Fourier transform ion cyclotron resonance mass spectrometry (ESI(+)-FTICR-MS). The molecular compositions of WSOM mainly comprised CHO and CHON compounds with equal important contribution. Detailed molecular information in the common formula of these two filters was explored. The authors found that water-soluble organic compounds were mainly from biomass burning and biogenic emissions. All compounds had relatively high DBE values suggesting potential high light absorption feature and have important application in atmospheric radiative forcing

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and biogeochemical effects in the remote region. As the analysis of molecular chemical compositions of WSOM using ultra-high resolution mass spectrometry in such a high altitude regions is rare and important, the data set provided by this work is thus very valuable. The authors also performed a comprehensive analysis on this dataset, and the findings, conclusions are well supported by such analyses. Overall, the paper is within the scope of ACP and generally well written and documented. I recommend publication of this paper in ACP after some revisions.

Specific comments: (1) Line 19, the weighted double bond equivalent (DBEw) was used here and in Table 1, however, the calculation method for DBEw was not given in Sect. 2.3 besides that for DBE, please added. (2) Line 69-76, the advantages of FTICR-MS method compared with the previous measurements in HTP as well as the wide usage of FTICR-MS worldwide need to be more emphasized in the introduction, whereas the current version were relatively simple. (3) Line 82-93, the logic in these sentences about the description of sampling site and instruments are confused, namely the sentence of "and the instruments used in this study...BC mass concentration" need to be moved before "A low-volume (16.7 L min-1)...". Overall, the description of sampling site and weather first following by the instrument. Besides, the instruments used in this study included a HR-ToF-AMS, PAX, and PQ-200, rather than just HR-ToF-AMS and PAX but description PQ-200 alone in the following part. (4) Line 163, "However, most of WSOM in PM2.5 is in accumulation size mode (less than 1 μm) which could be detected by HR-ToF-AMS.", please provide reference. (5) Line 190-191, please rephrase this sentence and make it easy to understand. (6) Line 197, the common ions are selected from the two samples in Fig. 3 and Table, however, how to calculate the RI for these common ions? From F43? please verify. (7) Line 202, "suggesting a relative higher oxidation and saturation degree" is different from that in Line 20 in abstract of " suggesting their medium oxidation and saturation degrees." (8) Line 205, EI is first mentioned here in the manuscript, please add the full description. (9) Line 207-208, the statement of "The CHO compounds had relatively higher O/Cw ratio than that of CHON compounds in these two samples" is inappropriate for F43 in Table 1,

please check. (10) Line 218-221, the author compared the DBR values (7.73-8.62 from Table 2) in this study with those in previous studies, however, the comparisons were not clear as the author declared that the DBE values is relatively lower than 5 – 9.5 (Song et al., 2018), but close to 9.4 – 10.7 (Dzepina et al., 2015), please rephrase. (11) Line 225-226, "The AImod, ..., was correspondingly higher in F43 which contained 49.1% aliphatic (60.4% in F30), 45.9% olefinic (36.8% in F30), and 5.1% aromatic compounds (2.9% in F30)." What was correspondingly higher in F43? The total number of the following three compounds? Consideration the higher number in F30 for aliphatic, the current expression is ambiguous. (12) Line 237-279, a total of 4554 and 5192 molecular formulas was identified for F30 and F43 and existed 3700 common molecular formulas, however, the unique molecular formulas were just 619 and 1142 for the two filter rather than the rest 4554-3700 and 5192-3700, please modify or add specific values to Table 1. (13) Line 258, "A threshold DBE/C value of 0.7 usually serves as a criterion to identify species with condensed aromatic ring structures", please added references. (14) Line 269-270, the RI values mentioned here are in this study rather than in the reference, please declare. (15) Line 313, there is no information about the 1N and 2N compounds in the Table 1. (16) Line 372, the 7.6% contribution of nitrogen-containing compounds to PM1 is from Zhang et al. (2018) for the entire long period rather than the two filter period (9% in Fig. 1), please added the reference to give a clear description.

Minor comments: (1) Line 18, change "are" to "were" (2) Line 22, change “significant” to “significantly” (3) Line 25, change “diagnose” to “diagnostic” (4) Line 26, change “highly” to “high” (5) Line 29, change "biomass mass burning" to "biomass burning" (6) Line 31, remove "are" (7) Line 53, change "could" to "can" (8) Line 57, remove "of", change "elevation" to "elevated" (9) Line 84, change "includes" to "included" (10) Line 92, change "with an average temperature..." to "and an average temperature..." (11) Line 101, 219, change "relative" to "relatively" (12) Line 218, change "than than of F30" to "than that for F30" (13) Line 260, change "were" to "have" (14) Line 366, change "particular" to "particulate"

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