

Interactive comment on "Application of a Hygroscopicity Tandem Differential Mobility Analyzer for characterizing PM Emissions in exhaust plumes from an Aircraft Engine burning Conventional and Alternative fuels" by Max B. Trueblood et al.

Max B. Trueblood et al.

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Anonymous Referee #1

We thank the referee for a very thorough review of our manuscript.

The referee's comments on various topics were very valuable and we believe that ad-

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dressing these issues considerably improves the manuscript.

-reviewer's comments (in italic typeset, blue font). -a point-by-point response (in regular typeset, black font)

RC#1 There are a large number of abbreviations in this manuscript. I would recommend to include a list of abbreviations at the end of the text. RESPONSE #1: We have inserted a list of abbreviations at the end of the manuscript.

RC#2 Page 3, line 12: In the text, the authors use the unit "L m-1" as the abbreviation of liter per minute. Since "m" is also used as the abbreviation for meter in many places in this manuscript, I would recommend to change the unit of flow rate to "L min-1". RESPONSE #2: We have changed the units to "L min-1" in the manuscript.

RC#3 Page 7, line 9: The authors claim that RHOu and RHOs are assumed to be known, but they only provide the assumed value of RHOu based on a previously published study. What is the assumed value of RHOs used in this study? RESPONSE #3: These values are added in a table in the Supplemental Data.

RC#4 Equation (2): Unit of the numerator (3.3_10-5), which seems cm K, should be added in the equation, because if the diameters are in nm in Equation (1), then the numerator would be (3.3_102) nm K. RESPONSE #4: We have made this correction. . RC#5 Page 8, line 7: The authors indicate that osmotic coefficients can be related to the square root of the molality by a 6th order polynomial function with considerable accuracy. How accurate, 1%? I would recommend to present the formula and give an example to demonstrate its accuracy. RESPONSE #5: This has been added in the Supplemental Information. Both a table and formulas are presented.

RC#6 Page 8, lines 8: Also for the osmotic coefficients, the authors mention that "it is diameter dependent and must be taken into account," but didn't clarify how to take the diameter-dependence into account. RESPONSE #6: This is dealt with in Eq. (8) and in the Supplemental Information at the end.

RC#7 Page 9, Table 1 and Figures 7-11: The diameter of dry particles is defined as "Xd" in the text, but in those table and figures, it is presented as "Xd". Please be consistent. RESPONSE #7: That table has been deleted.

RC#8 Page 15, lines 26: The authors claim that "The sulfur in the fuel is oxidized to SO2, which then undergoes rapid oxidation to SO3 and subsequently to sulfuric acid: : :" I agree with the authors that all the fuel sulfur is oxidized to SO2, but disagree that oxidization from SO2 to SO3 is rapid. In fact, it is very inefficient (_1-5%), as the two cited references indicated. RESPONSE #8: We have deleted the word "rapid".

RC#9 Page 16, line 8: Reference, Gysel et al. (2007), is not presented in the reference section. Please verify. RESPONSE #9: We have inserted this citation in the list of references.

RC#10 Page 16, line 14: For fuel sulfur content (FSC), the authors use the unit of _g of sulfur per g of fuel, but in Table 2, the authors also sue the unit of ppm. Please be consistent. RESPONSE #10: We have corrected this, and use ppm throughout to be consistent.

RC#11 Page 16, line 14: I don't understand the meaning of "old and modern cruise conditions". RESPONSE #11: The text in the manuscript has been updated to refer to combustor inlet temperature conditions. The references to old and modern cruise conditions have been removed.

RC#12 Could the authors provide an estimate of experimental uncertainties of the determined GF and SMF results in Section 5? RESPONSE #12: We have removed the hygroscopic property SMF and replaced it with Kappa based on the recommendation of another reviewer. The experimental uncertainties in GF and Kappa are now provided in Section 5. We have included the following sentences in the revised manuscript: "The uncertainty in GF was 9% particles with diameter ~10 nm, and 3% for the larger diameters (26 nm). The uncertainty in κ was 7% and 2% for particles with diameter ~ 10 nm and ~26 nm, respectively."

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RC#13 Page 21, line 5: the referenced journal should be "Atmos. Environ.". RE-SPONSE #13: We have corrected this in the manuscript.

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2018-507, 2018.