Manuscript: ACP-2016-419

Author response to referee #1

We thank the reviewer for their time and constructive comments for improving this manuscript. We have reproduced the reviewer comments below and have appended our responses to each of their queries in italics. Technical revisions and minor changes were highly appreciated and were followed as suggested. We have only reproduced the additional comments in the referee's supplement if rephrasing of entire sentences and additional data was requested or in a very few cases where we disagreed with the suggestions. Page numbers refer to the revised version of the manuscript.

Anonymous Referee #1 interactive comment

The manuscript reports results from analyzing gaseous and particulate matter collected from a field campaign in Australia during the dry season. The objective is to correlate the fraction of soluble iron to markers from natural and anthropogenic sources of aerosols, and to compare the amount of soluble iron in aerosols from this site to other sites reported in the literature. Overall the manuscript is organized and describes the trends in the figures and tables in detail. The major weakness of the manuscript is that there are key observations mentioned in the manuscript from data presented in a manuscript in preparation by Mallet et al. (See pages 4, 8, 12, 13, and 14). Hence, either the authors show the relevant data from that manuscript to support their arguments or wait on submitting this manuscript till the one by Mallet et al. is published.

Comment: Snice the original submission of this manuscript, Mallet et al. has been submitted to ACP Discussions (acp-2016-731). Several companion papers from the Savannah Fires in the Early Dry Season (SAFIRED) 2014 campaign in northern Australia have also been submitted or published in ACP Discussions, including a study of biomass burning aerosol aging (Milic et al., 2016) and savannah fire emission factors (acp-2016-708).

M. Desservettaz, C. Paton-Walsh, D. W. T. Griffith, G. Kettlewell, M. D. Keywood, M. V. Vanderschoot, J. Ward, M. D. Mallet, A. Milic, B. Milievic, Z. D. Ristovski, D. Howard, G. C. Edwards, and B. Atkinson. Emission factors of trace gases and particles in tropical northern Australia. MS No.: acp-2016-708.

M. Mallet, M. Desservettaz, B. Miljevic, A. Milic, Z. Ristovski, J. Alroe, L. Cravigan, R. Jayaratne, C. Paton-Walsh, D. Griffith, S. Wilson, G. Kettlewell, M. van der Schoot, P. Selleck, F. Reisen, S. Lawson, J. Ward, J. Harnwell, M. Cheng, R. Gillett, S. Molloy, D. Howard, P. Nelson, A. Morrison, G. Edwards, A. Williams, S. Chambers, S. Werczynski, L. Williams, H. Winton, B. Atkinson, X. Wang, and M. Keywood. An overview of the Savannah Fires in the Early Dry Season (SAFIRED) 2014 campaign in northern Australia. MS No.: acp-2016-731.

Milic, A., Mallet, M. D., Cravigan, L. T., Alroe, J., Ristovski, Z. D., Selleck, P., Lawson, S. J., Ward, J., Desservettaz, M. J., Paton-Walsh, C., Williams, L. R., Keywood, M. D., and Miljevic, B.: Aging of aerosols emitted from biomass burning in northern Australia, Atmos. Chem. Phys. Discuss., 2016, 1-24, 10.5194/acp-2016-730, 2016.

The comments below are minor and intended to improve the readability of the manuscript:

- The abstract is too long and contains a reference, which is not recommended. Revise for brevity and to highlight the main findings of the manuscript

Comment: The abstract has been shortened to highlight the main findings and the reference removed.

- Show correlation plots for soluble iron concentration versus oxalate and versus black carbon to support the discussion section

Comment: A correlation plot for fractional Fe solubility versus elemental carbon can be found in panel a) of Fig. S1. We have added panel b) to Fig. S1 of fractional Fe solubility versus oxalate.

- On page 3, combine paragraphs 2 and 3

Comment: Paragraphs 2 and 3 have been combined.

- On page 7, line 15, list the major cations and anions

Comment: As this paper uses oxalate and levoglucosan measurements. The heading has been changed to "2.6. Oxalate and levoglucosan"

- Revise the manuscript for long sentences (more than 3 lines in length) and shorten them

Comment: Long sentences have been edited throughout the manuscript.

- On page 9, switch the order of sentences between lines 5 and 10 to present data in Fig. 3 then Fig. 5

Comment: Sentences have been rearranged so that the references to figures are in chronological order.

- Revise the manuscript for consistency in citing figures as 'Figure' or 'Fig.'

Comment: We have followed the ACP guidelines for authors regarding the abbreviation of figures, i.e., "Fig." is used when it appears in running text and "Figure" is used at the beginning of a sentence.

- On page 10, comparisons with previous related work is summarized. It would be better to make a graph that highlights the similarities among different sites

Comment: Our fractional Fe solubility and total aerosol Fe data are compared to other Southern Hemispheric aerosol iron studies in Fig. 7. Different regions are colour coded to make visual comparison clearer.

- On page 15, cite a recent review article published on the surface and bulk chemistry of iron that is related to the discussion in this section: "Al-Abadleh, H. A., A Review on the Bulk and Surface Chemistry of Iron in Atmospherically-relevant Systems Containing Humic Like Substances. RSC Adv. 2015, 5, 45785 - 45811.",

Comment: This article has been cited on page 15 lines, 13-15. Thank you for this suggestion.

"In a review of Fe chemistry in systems containing humic-like substances, Al-Abadleh (2015) highlights the complexation and dissolution processes in which aerosol Fe solubility is enhanced with organic compounds."

- Use different types of marker shapes for Figure 7

Comment: Different shapes have been applied to the data points in Fig. 7.

- Rearrange figures in Figure S1 to enlarge font size in numbers and axis labels

Comment: The font has been enlarged in Fig. S1.

- Use different line styles for Figure S2

Comment: Different line styles have been applied to Fig. S2.

References

Milic, A., Mallet, M. D., Cravigan, L. T., Alroe, J., Ristovski, Z. D., Selleck, P., Lawson, S. J., Ward, J., Desservettaz, M. J., Paton-Walsh, C., Williams, L. R., Keywood, M. D., and Miljevic, B.: Aging of aerosols emitted from biomass burning in northern Australia, Atmos. Chem. Phys. Discuss., 2016, 1-24, 10.5194/acp-2016-730, 2016.