Answer to Referee # 1

We thank Anonymous Referee # 1 for their comments. Here below are the Authors' answers point-by-point (in blue) modifications to the text of the manuscript are reported in red.

Page 2, line 3: delete "also"
Deleted
Page 2, line 26: delete "and"
Deleted
Page 4, line 11: replace "and" with "at"
Replaced
Page 4, line 15: "laminar" instead of "linear" (see also page 5, line 16)
Replaced
Page 5, line 29: Lee et al. (2017) is missing in the references
The Referee is correct. We replaced "Lee et al. (2017)" with the correct reference "Lee et al (2018)"
Lee, B. H., Lopez-Hilfiker, F. D., Veres, P. R., McDuffie, E. E., Fibiger, D. L., Sparks, T. L., et al. (2018). Flight Deployment of a High-Resolution Time-of-Flight Chemical Ionization Mass Spectrometer: Observations of Reactive Halogen and Nitrogen Oxide Species. *Journal of Geophysical Research: Atmospheres*. https://doi.org/10.1029/2017JD028082
Page 5, line 30: "l min-1" instead of "liters per minute"
Changed
Page 6, line 5: please check the unit of the mass resolving power (usually expressed as Th/Th and not ppm)
The Referee is correct; the mas resolving power should be expressed in Th/Th. The mass accuracy of the instrument is usually better than 20 ppm. We changed the sentence from "The molecular formulae of the compounds listed above are readily identified given its mass resolving power (4500-5500 ppm (Junninen et al. 2010)..." to "The molecular formulae of the compounds listed above are readily identified given the instrument's mass resolving power (4500-5500 Th Th^{-1} (Junninen et al. 2010)…"
Page 6, line 11: "measure"
Corrected
Page 6, line 19/20: Do the authors mean by uncertainty the standard deviation of the signal at 1 Hz? Can you please also provide a value for the accuracy of the ammonia measurements?
The uncertainty described here refers to the standard deviation of the 1 Hz signal. As it can be indeed misleading, we rephrased this sentence. Systematic errors were minimized by performing frequent backgrounds during flights. We added this information to the manuscript. "The uncertainty of the NH3 measurement during UWFPS was 150 ppt (1σ at 1 Hz sample frequency). To account for potential systematic errors, caused e.g., by changes in cabin temperature, zero measurements were performed regularly during flights "
Page 6, line 27: (i) If the offset at zero NO can be as high as 0.2 ppbv, is there a periodic zero measurement and correction performed? (ii) In this line the units used are pptv and ppbv; before the unit ppt was used, please use pptv consistently
A periodic zero was done for 30 seconds every 5-7 minutes. The text has been changed eliminating the inconsistency in units and adding the remrks from Refereee# 2. "The measurement accuracy was 5% for O_3, NO_x, and NO_2 and 12% for NO_y. Periodic zeros were measured for 30 s every 5-7 min. Measurements were less accurate during periods of rapid altitude change due to a minor pressure dependence in the background zeros in the NO channel that could not be fully corrected during post-processing."
Page 7, line 25: please check the use of the word "when"
Replaced "when" with "with"
Page 7, line 30: "It is . . ."
Corrected
Page 7, line x30-32: since the AMS is not sensitive to particles < _70 nm, can the authors please also comment on the effects the exclusion of these small particles can have
The majority of the mass is in the larger particles. We estimate from SMPS measurements carried out during UWFPS at the William Browning Building on the University of Utah campus site that particle with diameters

smaller than 70 nm contributed to less than 0.5% to the total mass. We changed the sentence from "It also important to note that the term "total nitrate" in this manuscript refers to gas phase plus PM_1 nitrate, but may exclude a non-negligible part of nitrate from the coarse mode." To "It also important to note that the term "total nitrate" in this manuscript refers to gas phase plus NR-PM_1 nitrate measured with an AMS. While we estimate that particles smaller than 70 nm (lower end of the transmission efficiency of the AMS) contributed to less than 0.5% to the total mass, with our definition we may exclude a non-negligible part of nitrate from the coarse mode."

Page 8, line 19: remove open bracket

Removed

Page 8, line 26: the green data points (Cache valley) show even higher values (up to 100 µg m-3)

Changed from "During the second pollution episode, the highest aerosol mass concentrations were observed in Utah Valley (~70 µg m-3) and varied for Salt Lake and Cache Valley over the course of the episode (40 – 90 µg m-3)" into "During the first pollution episode, both the aircraft and ground-based aerosol mass concentrations were the highest in Cache Valley (~70 µg m^{-3} and ~90 µg m^{-3} respectively) and the lowest in Utah Valley (~10 µg m^{-3} and ~25 µg m^{-3} respectively). During the second pollution episode, the highest mass concentrations observed at the ground sites in Cache Valley were up to 100 ug m^{-3}, in Utah Valley were ~70 ug m^{-3}, and in Salt Lake Valley were up to 60 ug m^{-3}. These variations among valleys in peak PM2.5 concentrations are characteristic and are due to variations in sources and meteorological processes (Baasandorj et al, 2018) (Figure S2)."

Page 9, line 30: "C2H6"

We changed the sentence from "… showed a contribution from organic fragments, probably CH_2O or C2H6." To "… showed a contribution from organic fragments."

Page 10, line 18: "Augsburg"?

Corrected "Augsberg" to "Augsburg"

Page 10, line 21: "compared with"

Corrected

Page 11, line 11: delete "the"

Deleted

Page 11, line 18: "emissions" instead of "concentrations"?

Yes, we replaced "concentrations" with "emissions"

Page 12, line 5: "650 m AGL"

We added "m AGL" after "650"

Page 12, line 24: "divided by"

Corrected

Page 13, line 5: "than in Cache . . ."

Corrected

Page 14, line 20: the 20% contour line seems to be rather yellow-greenish instead of Orange

The referee is correct. We replaced "orange" with "yellow" in the text

Page 14, line 26: I read the figure such that when a counter line intercepts with the maximum value on an axis, both ammonia and nitrate need to be reduced in order to decrease the aerosol loading further. This would be the case for > _60% regarding nitrate.

We agree with the referee. We changed the sentence "However, both reagents must decrease in order to achieve a reduction of total aerosol mass larger than 40% relative to observed conditions." To "However, both reagents must decrease in order to achieve a reduction of total aerosol mass larger than 60% relative to observed conditions."

Figure 5: In most figures the unit µg m-3 is being used; it would be good not to switch between units (ppbv and µg m-3)

We changed the units to µg m^{-3}

Figure 7: The agreement between UHSAS and AMS data is generally very good except for the bottom panel on the left. Is there any explanation why the concentrations differ in this profile?

We improved the time alignment for UHSAS and AMS in a new version for Figure 7. The agreement between UHSAS and AMS in the bottom panel is within experimental uncertainties (Figure S6).

SI (1st paragraph on page 1): Can the authors please specify what velocity they are referring to (particle velocity in the sampling line, velocity in the AMS flight chamber, . . .)?

We modified the paragraph by adding the text in red: “Normal procedures were used to calibrate the AMS flow rate as a function of measured lens pressure and particle time-of-flight velocity (i.e. the velocity of the aerosol particles in vacuum, from the chopper to the vaporizer) as a function of particle size [Canagaratna et al., 2007]. For airborne measurements, we used a pressure-controlled inlet (PCI) that maintained a constant mass flow rate into the AMS [Bahreini et al., 2008]. Because particle time-of-flight velocity depends on … the PCI also provided a stable particle time-of-flight velocity calibration.”