Reply to reviewer:

The reviewer of the revised manuscript had three comments. The first asked us to “give numbers of uncertainties on size estimations”. These are in section 2: “With sufficient averaging (minutes), the volume derived from optical size distributions has an uncertainty propagated from size and flow uncertainties of about +13/-28% in the accumulation mode and up to +/- 50% above 1 µm (Kupc et al., 2018; Brock et al., 2019). Excellent agreement between extinctions calculated from the size distributions and independent extinction measurements indicates that systematic errors may actually be less than this (Brock et al., 2019).” Volume is the most important property of the size distributions for this work. Readers interested in uncertainties for other properties of the size distribution may consult these two references. This comment also asked if the trends in Figure 5 are statistically significant. It is not clear which trends the reviewer was referring to. The increase with altitude in meteoric particles is definitely significant. We have added a sentence saying that more measurements would be needed to determine if the observed seasonal differences are persistent between years. The issue goes beyond just measurement uncertainty in the measurements to how representative any single mission can be. For example, if some concentration in August 2016 was more than in February 2017 is it because concentrations are larger in August or because 2016 had high concentrations?

The second comment asked about mis-classified particles, especially organic-sulfate particles misclassified as meteoric or sulfuric after the pyroCb event. In response to this comment we manually reviewed the classification of a sampling of particles after that event and did not find any erroneous classifications. The meteoric-sulfuric particles in the ATom3 Northern Hemisphere (after the pyroCb) were indeed slightly larger than during other deployments. This is not the result of misclassification. We do not yet understand the reason for the slightly larger size. We have added a paragraph at the end of section 3 illustrating some of the broader features of the composition-resolved size distribution that we are confident in as well as some narrow features in which we are not confident. The reviewer also asked why subsidence shouldn’t lead to more meteoric particles during winter and spring than summer and fall. One should remember that we are defining our penetration into the stratosphere with ozone. Subsidence brings down both more meteoric particles and more ozone, so a scatter plot like Figure 5 will not to first order show the effect of subsidence.

The third comment from this reviewer asked why there is less carbon in the meteoric-sulfuric particles in the SH than in the NH. This is discussed in section 4, near line 265.