

Reviewer #1

We would like to thank the reviewer for his/her comments and suggestions. The revisions are shown in purple colour in the new manuscript. In the following we provide our response to the comments:

General comments:

Chapter 4.2.1: “*The chapter remains rather inconclusive with respect to the actual contribution of BB on L1*”:

We add a conclusion in section 4.2.1: “The comparison between the CO and NH₃ distributions highlights two areas of high concentrations for both species along the air mass trajectories (labelled by dates with black circles in Fig. 8): one over Siberia (130°-160°E, 60°-65°N) and the other one over Alaska-Canada ((-125°)-(-155)°E, 50°-70°N), . The correlation between CO and NH₃ plumes suggests a biomass burning origin for the enhanced concentrations, and not high CO concentration due to the imported pollution from other regions. This is further confirmed by the location of the MODIS fire counts (Figure 8, bottom).

We thus have three candidate regions for pollution to explain the unusual CO measurements in the polar atmosphere: anthropogenic emissions from East Asia and fire emissions from Alaska-Canada and Siberia. In addition, backward-trajectory calculations (section 3.4.2, Fig. 5A left) have shown pollution from North America origin. In the next section, we test the relative impact of each region on the polar atmosphere on 7 August 2009 for L1.”

Fig. 7: “*I would find it very helpful, if the authors add trajectory positions in their Fig.7. I did this myself, and it seems that the trajectories passed over the fires in North America around August 1, while the fires in Asia did not influence the probed air mass at all.*”:

As in Fig.6 (new Fig. 7), the trajectories have been localized every day in Fig.7 (new Fig.8). We agree to say that the fires in North America seem to have a larger influence compared to the fires in Siberia. However some trajectories (point on 28 July in Fig.8), 10 days before the balloon flight, start near the area of fires in Siberia (see new Fig 5.B) and thus in section 4.2.2, we test the effect of these two areas of fires (see conclusion in section 4.2.2 for more information).

Technical correction:

Page 15515, line 11: This sentence has been rewritten.