

## ***Interactive comment on “Measurements of atmospheric aerosol vertical distributions above Svalbard, Norway using unmanned aerial systems (UAS)” by T. S. Bates et al.***

**T. S. Bates et al.**

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We thank anonymous referee #1 for their helpful comments. We detail our responses below:

Specific comments

What was a typical climbing rate for these research flights?

We have added to the manuscript:

"The aircraft is capable of flight at a maximum service ceiling of 3660 meters Above

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Mean Sea Level (AMSL), cruises at 26 m s<sup>-1</sup> and has a total endurance of up to 4.5 hrs (take-off to recovery) with a main and 2 wing fuel tanks (8.1 L fuel). The typical climb rate during research flights is 1.25 m s<sup>-1</sup>. For data collection averaged over 60 s (e.g. aerosol light absorption, see below), the vertical resolution is 75 m and the horizontal resolution is 1560 m."

How much time was spent in the layer with highest particle concentration?

We have added to the manuscript:

"The typical flight plan was to ascend to 2700 m, descend to the altitude of maximum aerosol concentration, and then to sample at that altitude for the remainder of the flight (typically 1 to 2 hours)."

Please specify the response time of the instruments. This with the climbing rate specify the vertical resolutions. Please also specify the horizontal resolution in kilometers for a typical flight pattern.

See above paragraph

Please speculate why the filter sample analysis did not work.

We show that given the volume of air that we can sample in 1-2 hours, the concentrations of the major ions are below our detection limit in this environment. We suggest alternate techniques for analyzing the filters in the future.

Svalbard is situated very north. What were the meteorological limitations for such UAS flights?

We have added to the manuscript:

"The real-time temperature and RH data are especially important in high latitude environments where ice on the pitot tube could quickly bring the plane down."

Page 2484, row 10: Please put into the context the concentration of 1000 cm<sup>-3</sup>. What

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were typical on-ground values measured for example at Gruvebadet Laboratory in same season?

Figure 3 shows the typical ground concentrations of 500-100 cm<sup>-3</sup>.

Technical corrections

Page 2484, row 10: ) missing

done

Please add the scale of the map to Fig. 4

done

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Interactive comment on Atmos. Meas. Tech. Discuss., 6, 2483, 2013.