Dear Professor Harald Saathoff,

We appreciate your careful consideration of our manuscript. We have carefully responded to all of your point-by-point comments and have revised the manuscript accordingly. These revisions are described in detail below.

**General comments**

I think you have addressed the reviewer comments well and improved your manuscript significantly. Therefore, I have only a few final comments which I would like you to take into account.

**Response**: Thank you so much for your positive comments.

**Specific comments:**

Line 136: “…of Fe and Mn were…” -> “…of iron and manganese were…”

**Response**: Thank you. It has been corrected in line 136 in the revised manuscript.

Lines 188-189: “Around 50 % of NH$_4$NO$_3$ remained in the mixture due to evaporation” -> “Around 50% of the NH$_4$NO$_3$ remained in the mixture even after heating and potential evaporation”

**Response**: Thank you. It has been corrected in lines 188-189 in the revised manuscript.

Lines 299-300: “On the other hand, secondary transform of SO$_2$ to sulfate should also have influence on the SOR” -> “On the other hand, secondary transformation of SO$_2$ to sulfate should also have an influence on the SOR”

**Response**: Thank you. It has been corrected in lines 299-300 in the revised manuscript.

Line 400: “…4.2 calculated…” -> “…4.2 as calculated…”

**Response**: Thank you. It has been corrected in line 400 in the revised manuscript.

Lines 436-437: “It should be noted the mass transfer of SO$_2$ was not thought as the
RDS..." -> “It should be noted that the mass transfer of SO$_2$ was not assumed to be the RDS...”

**Response**: Thank you. It has been corrected in lines 436-437 in the revised manuscript.

Line 441: “…might be greatly overestimated...” -> “…might have been overestimated...”

**Response**: Thank you. It has been corrected in lines 441-442 in the revised manuscript.

Lines 510-511: “…salts overall underestimated around 13 % of that calculated...” -> “…salts is underestimated by around 13% compared to that calculated...”

**Response**: Thank you. It has been corrected in lines 510-511 in the revised manuscript.

Line 583: “…while a small value was...” -> “...while a smaller value was...”

**Response**: Thank you. It has been corrected in line 583 in the revised manuscript.

Line 642: “Aerosol acidity is one of important factors...” -> “Aerosol acidity is one of the important factors...”

**Response**: Thank you. It has been corrected in line 643 in the revised manuscript.

Lines 644-646: “…aerosol liquid phase decreases as a function of pH because the oxidation of S(IV) by transition metals is the dominant path and is negatively dependent on aerosol pH” -> “...aerosol liquid phase decreases with decreasing pH because the oxidation of S(IV) by transition metals is the dominant path and is decreasing with aerosol pH”

**Response**: Thank you. It has been corrected in lines 645-647 in the revised manuscript.