

## ***Interactive comment on “Airborne measurements of the nitric acid partitioning in persistent contrails” by D. Schäuble et al.***

**D. Schäuble et al.**

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We would like to thank the referee for his/her comments that helped to improve the manuscript.

We changed the wording as suggested.

Comment 1: We incorporated a short description of the model in section 1. [Kärcher et al. \(2009\)](#) has recently been published in JGR.

Comment 2: We included the formula for the calculation of rough estimates of contrail age into section 3. The reference was changed from Schumann et al. (1998)

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to Anderson et al. (1999) where this formula is explicitly mentioned.

Page 14168 line 20: As the  $\text{NO}_y$  instrument has been used on different research aircraft for several years, we added only one sentence to describe the calibration and changed the reference from Ziereis et al. (2004) to Ziereis et al. (2000), where the instrument is described in more detail and further reference is provided.

Page 14170 line 16-18: The amplitude of the adjustment was included in the text, as well as the total uncertainty in IWC.

Page 14172 line 1: The first sentence was removed.

Page 14172 line 2: "Top regions of frontal cirrus" was changed to "upper regions of frontal cirrus" throughout the paper.

Page 14172 lines 23-24: "(red circles)" was removed from this sentence.

Page 14175 line 17: We incorporated an explanation how we attribute contrail ages to mean particle diameters. This estimate is uncertain as stated several times in the text. The errors in the mean particle diameters resulting from the FSSP measurements are shown in Fig. 4.

Page 14177 lines 7-10: In lines 1-3 we describe that the solid curve represents the full expression (Eq. 1). We added a sentence to the caption of Fig. 4 to clarify the description.

Page 14177 lines 21-23: In comparison to the average of all the contrails, the contrails that follow the dashed curve in Fig. 4 are characterized by low amounts of particulate nitric acid and large ice water contents. We point out that we speculate

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about the reason for these measurements. Although there is no further evidence in the data, our explanation is plausible.

Page 14184 Figure 1: From 43,500 s to 44,000 s UTC the contrails are embedded in cirrus clouds. Therefore we expect a difference between  $\text{NO}_y^{\text{tot}}$  and  $\text{NO}_y^{\text{gas}}$  during this period. From 44,000 s to 45,000 s UTC the difference between  $\text{NO}_y^{\text{tot}}$  and  $\text{NO}_y^{\text{gas}}$  seems to be an instrumental artefact. We did not include contrails from this time interval in our analysis. The corresponding cirrus data was removed from the  $\text{HNO}_3/\text{H}_2\text{O}$  molar ratio and  $\text{HNO}_3^{\text{ice}}/\text{HNO}_3^{\text{tot}}$  analysis. This increased the campaign averages in  $\mu$  and  $\phi$  by about 2% but the rounded values given in the paper are not affected. Figure 2 and the histograms were updated. Only the 217K-means changed visibly in the top and the middle panel of Fig. 2.

Page 14184: The flight overview (Fig. 1) was enlarged in the vertical.

## References

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