

Interactive comment on “Assessment of the NO-NO₂-O₃ photostationary state applicability on long-term measurements at the GAW global station Hohenpeissenberg, Germany” by K. Mannschreck et al.

K. Mannschreck et al.

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We would like to thank both referees for their interest in our paper and their suggestions. We have revised the paper under consideration of the referees comments. They are addressed in the following in the order as they appear in the referees letter.

Referee #1

The general comment raised concerning the implications of our findings concerning PSS derived peroxyradicals and recommendations for siting of measurement stations has been considered in the text and in our reply to the referee comment concerning Page 2021 (see below).

Specific comments: The title has been changed according to the referee suggestion.

Page 2004, line 6: We agree that the data in the abstract concerning the theta and theta_ext values may be confusing. We have now rearranged this section and clearly differentiated between both terms.

Page 2005, line 17: As stated by the referee the cases in which reactions converting NO to NO₂ are negligible (theta = 1) are very rare and limited to very polluted conditions. We have added a sentence to make this more clear.

Page 2006, line 13: We have noted the paper by Yang et al. [2004] which is also concerned with deviations from PSS. We have, however, decided not to include it in our discussion since the measurements have been carried out in predominantly marine environments rather than under continental conditions (the latter have even been filtered out in the data set by Yang et al.). Our investigations are based on much higher NO mixing ratios (0.5-1 ppb or sometimes higher) than the ones used by Yang et al. (less than 15 ppt). The biases at low NO_x levels discussed by Yang et al. are therefore not relevant for our investigations.

Page 2008: According to both referees suggestions we have included a photo of the station showing the old and the new building as well as the relevant features (e.g. forest).

Page 2012, line 4: We have now added a short section describing the CO measurements and included the uncertainty and detection limit of CO measurements in table 1.

Page 2012, line 25: The referee states that the difference between the theta and theta_ext plots are not made clear in the text. We have therefore added a sentence to make clear that in Figure 5 a different approach is used.

Page 2013, footnote: The referee says that the dependence of RO₂ on JNO₂ which is used to calculate [RO₂] from measured JNO₂ is not explained. However, we have

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used simultaneous measurements of RO₂ and JNO₂ carried out during a campaign at our site to derive a functional relationship between these two parameters. This function which is solely based on our observations was used as a first approximation to calculate RO₂ for the other periods. We have, however, rearranged the corresponding section to make our procedure more clear and added the information that we have found a linear dependence in our observations.

Page 2015, line 2: We have modified the plots (Figures 5, 7, 8) in a way that the sectors A and B can be identified easier by the reader.

Page 2016, line 1: We have now changed the argument concerning diesel vehicles as a possible NO₂ source by giving the typical NO₂/NO ratio instead of the maximum ratio and included a reference for the given value.

Page 2016: We have added a brief discussion on biogenic hydrocarbons and aerosols justifying why these compounds may not have a significant influence. The mixing ratios of measured biogenic hydrocarbons are too low and the turn-over rate is small. Moreover we do not see a pronounced seasonal variation in deviation from PSS which should however be the case when biogenic hydrocarbons and aerosols play a significant role.

Page 2017, section 4.1: We have followed the referee suggestion and included a sentence stating that the forest is mainly coniferous.

Page 2021: The referee suggests to conclude the discussion with further implications of the results and recommendation regarding a measurement site. Our results show that local effects have a strong impact on measured NO₂/NO ratios leading to misinterpretations when determining PSS derived peroxy radical concentrations. Local effects can be manifold, e.g. topography around an observation site, advection pattern, type and extension of vegetation, general climatic conditions. The most probable case is that we have a mixture of different effects and the problem is that we cannot distinguish and quantify them. A detailed investigation of air flow conditions at the site would be

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needed to approach this problem. This, however, could then not be generalised for other stations. However, as a general guideline we suggest that free advection of air masses and spatially homogeneous irradiance is required when investigating PSS. We have added a respective phrase at the end of the conclusion.

The corrections on page 2029 and 2034 as well as the technical correction have been made according to the referee suggestions.

Referee #2

Abstract: the first sentence has been changed.

Page 2005, last paragraph: we have avoided the expression, which might lead to misunderstandings.

Section 2.1: From our point of view a detailed description of the measurement site is essential for the understanding of the whole problem. Our study shows that local effects arising from forest and other vegetation, different inclinations and advection patterns in different wind directions lead to deviations from PSS. Although we cannot quantify the contributions of the individual effects the features in the different wind directions are important for the interpretation of the results. The photo of the site is included.

Page 2010: we have changed the section on JNO₂ measurements by focussing on the main points. The 2001 instead of 2002 was a typing error and has also been corrected.

Section 2.3: The lower threshold was chosen in a way that the results can be compared with other published studies where usually a threshold of 0.006 s⁻¹ or 0.005 s⁻¹ is chosen. We have added a reference as an example in the text.

Page 2012: error is corrected

Page 2013: We have added a phrase explaining that the range of +/-0.2 was chosen since the overall uncertainty is 20% (as explained in the text).

Page 2015: We disagree with the referee suggestion. A summary of the experimental

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results is given in the first section of the discussion and an overview on results and discussion is given in the abstract.

Page 2016: Yes, the other results are similar and we have added a phrase stating this. Showing the results of all years each time would just make the paper longer without giving more information.

Page 2017: According to the referee suggestion the section was shortened with reference to section 2.1 where the vicinity of the site is described in detail.

Figures: all corrections on the Figures have been made according to the referees suggestion.

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 2003, 2004.

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