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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Formaldehyde and nitrogen dioxide over the remote Western Pacific Ocean: SCIAMACHY and GOME-2 validation" *by* E. Peters et al.

Anonymous Referee #1

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This is an interesting paper about ship-based MAX-DOAS measurements of formaldehyde and nitrogen dioxide performed over the Western Pacific Ocean during the TransBrom campaign in October 2009. As illustrated in this study, these measurements are highly valuable for the validation of satellite observations in this region where correlative data are very sparse. New estimates of the background HCHO and NO2 concentrations over the remote ocean are derived and concentration enhancements can be observed in the vicinity of the coasts and shipping routes. The different observational data sets and their corresponding retrieval methods are generally well described and the results are clearly presented, although the discussion is very qualitative at some places. I recommend the paper for publication in ACP after addressing the following

specific comments:

Title: For a large part, the paper deals with MAX-DOAS observations of HCHO and NO2. To my opinion, the term MAX-DOAS should therefore appears in some way in the title. Suggestion: 'Formaldehyde and nitrogen dioxide over the remote Western Pacific Ocean: SCIAMACHY and GOME-2 validation using ship-based MAX-DOAS observations'.

Page 15988, lines 1-2: A single NO2 profile is used to calculate stratospheric NO2 airmass factors at twilight, in the 88-92°SZA range. It is well know that stratospheric NO2 shows a strong diurnal variation which has a significant impact on the airmass factors, especially at such large SZAs. Why this effect is not taken into account here ? Is it included in the error budget of the stratospheric NO2 vertical columns ?

Page 15989, lines 7-8: The DOFS ranges from 2 to 3. Is it the case for both NO2 and HCHO ? I think the authors should show typical examples of NO2 and HCHO profile retrievals including plots of a priori and retrieved profiles and corresponding averaging kernels. It would help the reader to see where is located the information content and if there are differences between both trace gas species.

Sections 4.1, 4.2, and 4.3: time-series of stratospheric NO2, tropospheric NO2, and HCHO vertical columns appearing in Figures 4, 8, and 13 are discussed. Although error bars corresponding to MAX-DOAS measurements are plotted in these figures, nothing is said in the paper on how those error bars are calculated. This should be added in the revised version of the manuscript.

Page 15997, line 22: How do you estimate the detection limit for HCHO ? Using the same method as for NO2 ? If yes, this should be mentioned.

Technical corrections:

Page 15978, line 4: For me, -20°S means 20°N, so the – sign should be removed. Same correction at page 15999/line 12 and page 16001/line 6

Page 15979, line 4: ‘Visible’ should be replaced by ‘visible’

Page 15980, line 24: ‘ground-based’ instead of ‘ground based’

End of Section 1, page 15981: A short description of the different sections of the paper would help the reader.

Page 15982, lines 6-19: Adding a table summarizing the different weather conditions encountered during the cruise would help the reader.

Page 15985, line 17: ‘visible’ instead of ‘Vis’

Page 15987, line 12: ‘. . .given in Pinardi et al. (2012), the 335-357 nm fitting window. . .’ instead of ‘. . .given in (Pinardi et al., 2012), a fitting window from 335-357 nm. . .’

Page 15989, first sentence of Section 4.1: I suggest to replace it by ‘. . .due to photolysis of N2O5 causing NO2 to increase during the course of the day, e.g. a recent study found an increase of . . . for the subtropics (Gil et al., 2008).

Page 15992, line 16: ‘Takashima et al. (2011)’ instead of ‘(Takashima et al., 2011)’

Page 16000, line 13: Remove the comma between regions and where.

Page 16011 (Fig. 2): This figure is not very clear for me. What represent the grey shape and the orange rectangle ?

Page 16013 (Fig. 4): ‘grey’ instead of ‘gray’

Page 16016 (Fig. 7): Replace ‘The Cruise Track is indicated.’ by ‘the cruise track is indicated by the white line.’

Page 16020 (Fig. 11): The cruise track would appear better if plotted in white as in Fig. 7.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 15977, 2012.