

Interactive
Comment

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

Received and published: 16 August 2012

This is an interesting paper about ship-based MAX-DOAS measurements of formaldehyde and nitrogen dioxide performed over the Western Pacific Ocean during the Trans-Brom 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

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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 appear 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 air mass factors at twilight, in the 88-92° SZA range. It is well known that stratospheric NO₂ shows a strong diurnal variation which has a significant impact on the air mass 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

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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.

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