Atmos. Chem. Phys. Discuss., 9, S2184–S2188, 2009
www.atmos-chem-phys-discuss.net/9/S2184/2009/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "BrO measurements over the Eastern North-Atlantic" *by* M. Martin et al.

Anonymous Referee #2

Received and published: 18 May 2009

General Comments

This paper presents Multi Axis DOAS measurements made on board the Poseidon ship, which cruised along the West African Coast from the 9th to 24th of February 2007. The authors focused their study to BrO, though IO measurements were also made (but found to be insignificant).

These measurements add to our knowledge by investigating the African coastal upwelling region, though are limited (as all ship based measurements) in location and time, but therefore have high specificity. Only one day high value of the BrO vertical column is provided, the paper could be significantly strengthened if the authors performed their analysis over the entire dataset. Given how difficult it is to compare differential slant column density measurements the state of DOAS science is now to present vertical columns (or profiles), with a corresponding error and information analy-

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

sis. I was disappointed that there was not a more thorough analysis of this dataset. No figure presents vertical column densities, only one vertical column, providing the key conclusion, is presented in the paper itself. There is no information analysis that would allow readers to see over what vertical range the DSCDs are providing VCD information - which can be readily compared with other measurements of BrO. A discussion about the timing of the SOPRAN and its aims would be valuable. These measurements do not represent a time of year or location that is known for being extremely convectively active (thus having stratospheric implications for these high BrO values). The implications for air quality of the oxidizing capability in this region cannot be assessed with these measurements alone (they are inferred, but no ozone and NOx species measurements are given in support). As the paper stands, what is presented is not substantive enough to support the authors conclusions and for me to support its publication within ACP. Perhaps this paper would be better placed within a special issue with other SOPRAN publications, where auxiliary and supporting measurements are also available. A back-trajectory study of the source air (rather than using just the wind direction at the measurement site) is absolutely essential to support source region claims. An information analysis (i.e. at least showing AMFs) is needed. Improvement upon the adhoc aerosol retrieval is needed. Presenting the whole VCD time series for the cruise and a comparison with complementary (either satellite or onboard) measurements of bromine is needed to support the high BrO conclusions and increase the scientific value of this work. With such a high BrO concentration it must have been seen by satellite measurements, unless there is clouds below which the satellite cannot see, in which case: how have these cloud effects been dealt with in the RT AMF analysis, and what errors are introduced?

I believe the dataset is a useful and valuable one. I appreciate that the measurements are difficult to make and such measurements are scarce. I hope that the authors can perform the additional work required to do this nice dataset justice.

Specific Comments

ACPD

9, S2184–S2188, 2009

Interactive Comment

- Why was this time of year chosen for the cruise, is it a particularly active or inactive phytoplanktion/upwelling time of the year for this region, does this time of year represent stable weather conditions? Is there a reference for SOPRAN, where the aims of the campaign are outlined? Were any supporting in situ bromine measurements also made during this time? It would be useful if how these MAX-DOAS measurements of BrO support the aims of this campaign were given.

- While meteorological data is referred to a number of times, and some dust measurements are mentioned as a personal communication, no other auxiliary observations were discussed. Supporting satellite observations of BrO at this time and location would strengthen (or not) the case for transport from distant bromine source regions that the authors postulate. It would be appropriate for the authors to support their claim with a back-trajectory study.

- The authors outline how the vertical column can be derived from the slant column measurements using the Monte-Carlo derived McArtim air mass factors. However, only differential slant column measurements are presented in the figures.

- Only the VCD for the 18th of February is presented, (because this was the largest) considering this value is central to the conclusions of this paper (the high BrO vmr is quoted in the abstract and conclusion). I believe would be a figure (or two) with the VCDs over the entire cruise period, in both absolute concentration and volume mixing ratio units (with the layer thickness assumptions, this could be achieved with multiple y-axes representing different layer thicknesses).

Page 9294, line 23 The BrO MAX-DOAS measurements presented here were made during a cruise P348 - i.e. remove the indirect reference to the MAX-DOAS technique of Platt and Hönniger (this should be in the measurement section).

Page 9295 Section 2, this section should be condensed and restructured, the details in the 'field measurement'; section could be in the overview, and the slant-column, AMF details should be in the data analysis subsection

ACPD

9, S2184–S2188, 2009

Interactive Comment

Page 9295 line 15, Hönniger 2004 assumes multiple scattering can be neglected, this is not what is done in this work, this should be clearly stated.

Page 9295 line 19 'Since L is difficult to determine' - the logical sequence? L is still difficult to determine whether or not VCD is introduced. Perhaps: The VCD, independent of the measurement specific light path, is determined to facilitate intercomparison with other measurements from different platforms and model values.

Page 9297, line 2: remove sentence: The FRS details are given below where the acronym is again introduced, it is redundant here.

Page 9298, line 28. The use of adhoc 'guesses'; of the aerosol profile is a significant backwards step relative to the standard set in the current literature i.e. by Wagner et al. Atmos. Chem. Phys., 7, 3129-3142, 2007, Frießet al. JGR. 111, D14203, doi:10.1029/2005JD006618, 2006. The authors can significantly improve their methodology here.

Page 9299 line 14. Why are these values for albedo, single scattering albedo and asymmetry chosen? Are they realistic for this area and time of year? What influence do these assumptions have on the results?

Page 9300 line 28 and elsewhere: A back trajectory study is essential to make this claim.

Page 9303, line 20. A reference for the 10^8 value of HO_2 would be good here. Was ozone also detected on board? What do your O_3 slant columns show? Is there evidence to support the halving of the O_3 lifetime along the coastal region?

Technical Corrections

Page 9292 line 8, typo ways
Page 9292 line 10, the abundance is and the significance is (noun subject agreement)
Page 9293 first sentence: the estimation of BrO concentrations have large uncertainties due to insufficient accurate measurements and/or difficulty in measuring BrO - not

ACPD

9, S2184–S2188, 2009

because of sources, reactions and loss processes, do you mean here rather the predictability or modeling of tropospheric BrO concentrations?
Page 9293, line 14: remove 'which are'
Page 9293, line 24: is there any literature support for halogen reactivity upon dust surfaces?
Page 9293, line 28: space gas phase
Page 9293, line 29: typo elsewhere
Page 9294, line 2: in the first sentence the subject is plural, therefore here, They not It should be the subject, it would be better to say Bromine or Bromine species.
Page 9294, line 14 and elsewhere: consistency: mid-latitudes (here it is hyphened, elsewhere not)
Page 9294, line 21 showed a nearly
Page 9298, line 28, 'BrO data analysis' replace with 'with DOAS method'
Page 9302 line 7 First? Maybe the use of bullets or numbering would improve this section.
Page 9302 line 10, 19 and 23 use of Furthermore and Also to begin a paragraph is poor English usage, a paragraph should stand on its own, maybe use of bullets as related to above comment?

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 9291, 2009.

ACPD

9, S2184–S2188, 2009

Interactive Comment