



Interactive comment on “Ship emissions of SO₂ and NO₂: DOAS measurements from airborne platforms” by N. Berg et al.

Anonymous Referee #2

Received and published: 6 December 2011

General impression:

It's a pity the authors did not finish the AMF simulation, before submitting.

The authors spend a lot of time and money on the performance of very interesting measurements. Also the discussion seems to be well done including the modelling of the ship emissions for individual ships. However, they did not spend an adequate time on the radiative transfer simulation. Instead they tried to estimate the geometric light path by assuming a reflection of the light path at the water surface and included additional information about the water waves. Indirectly they thereby assumed that the

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



incoming radiation is completely homogenous – no angle dependency. I am afraid, that this is a big mistake, as the incoming radiation is dominated by the sun's position. Therefore I recommend to estimate the light path by using a radiative transfer model, at least for some selected cases. Cases such as “Maas Viking” or “Saalitus” showing a high discrepancy between DOAS measurement and model simulations might be good examples perhaps the difference can be reduced by using a better AMF. Another example might be the measurement in the plume of “Stena Hollandica” as shown in figure 12, it seems the SCD depends on the viewing direction.

In the DOAS analysis the authors included the Ring cross section and the respective trace gas, SO₂ or NO₂, however it seems no additional trace gases were included. From my experience it is highly dangerous to do a DOAS analysis for SO₂ without including ozone. Please re check the analysis, in this case I would not expect a big difference as the time difference between the reference and the measurement is of the order of a few seconds. However, if the NO₂ concentration is high you might observe a reduction in ozone, which might be interesting as well.

Comments: P6277L13 The instrument consists of two spectrometers; however to me it is unclear whether one telescope or two telescopes are used. Please clarify: “The spectrometers are connected to a quartz telescope” one telescope for both, or “Each spectrometer is connected to a quartz telescope” two telescopes for two spectrometers.

P6277L20 “Longest exposure time. . . ” for which of the two spectrometers or for both.

P6287L1-9 You did not include any other cross section, only Ring and SO₂ / NO₂? How about Ozone? See general comment.

P6280L11-13 seems correct but why don't you use a vector equation: $v_{aw} = v_{ship} + v_{wind}$

P6281L13 The position data might be the first thing, of interest, in figure 12 it seems there might be a slight temporal offset between the position and the SCDs, otherwise

[Full Screen / Esc](#)[Printer-friendly Version](#)[Interactive Discussion](#)[Discussion Paper](#)

the enhanced SCD north of the ship track cannot be explained. The roll angle of the plane is not mentioned but surely included in this list, this might be essential for the AMF calculation.

P6286L1 you removed equation 10, as I recommended, please also remove the reference to the equation.

P6288L11 Add “In preparation” to the reference Mellqvist and Berg, 2011

P6298 F1 and 2 Please use wavelength in nm for the X-axes.

P6309 F12 Can you remove the blue background from the picture?

P6312 F15 The legend is incomplete; the red bar is probably model data as in the previous figures.

Interactive comment on Atmos. Meas. Tech. Discuss., 4, 6273, 2011.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

