

Interactive comment on “Simultaneous satellite observations of IO and BrO over Antarctica” by A. Schönhardt et al.

Anonymous Referee #1

Received and published: 13 February 2012

This paper describes 6 years of observations of the IO and BrO radicals over Antarctica, including the sea-ice margins of the continent. The measurements are made by the SCIAMACHY instrument in nadir-viewing mode, and thus represent column abundances. The focus of the study is on the spatial and temporal differences of the two radicals between spring and autumn i.e. during the period when sunlight is present to enable the measurements to be made. In the case of BrO, there is a large stratospheric burden. This is not subtracted off, because the tropospheric enhancements are large enough to show clearly where the BrO is located around the continent. For IO, there is no indication of significant concentrations outside the boundary layer, so the observed IO columns most probably represent IO located in the first 100 m or so.

The exciting scientific result is that there are marked differences in the seasonal be-

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haviour of the radicals, providing further evidence that the two halogens have different sources. An intriguing result is that IO appears later than BrO, and significant concentrations occur over sea-ice which is in the process of breaking up in late spring.

The paper thus makes a significant contribution to understanding halogens in the polar regions. It is very clearly written and appropriately illustrated. Apart from the list of minor corrections below, the authors might wish to consider the following points - (which may be something for a future study):

1. Given that the IO is very likely close to the surface, it would be useful to provide the reader with some sense of the concentrations of IO that are probably being observed. Comparison with the long-path DOAS measurements of Saiz-Lopez et al would provide a useful benchmark. It is the concentrations that matter for understanding the atmospheric significance.
2. One conclusion of the paper is that the role of biology on the underside of sea-ice in producing gas-phase iodine needs now to be studied in situ. That implies that these levels of IO matter. But this paper does not really explain why, or simply assumes that it is self-evident. Ozone depletion is mentioned in the introduction; however, presumably ozone is not substantially destroyed within this boundary layer, or IO and BrO would not be formed. The satellite provides the unique opportunity to see what difference these IO levels make on a regional-to-continental scale. A few sentences indicating how this might be done, in combination with modelling, would be helpful.
3. The discussion on page 9 about averaging the monthly data from 6 years is fine to get the seasonal trends. However, there are year-to-year differences (e.g. between 2006 and 2009) which are quite significant. Are there any indications of why, for instance any linkage to sea ice coverage?

Minor points:

page 3, lines 11/12: one of the co-authors (Gomez Martin) published a recent paper

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in Z. Phys. Chem. which made significant progress in understanding how iodine oxide particles form and grow in the marine environment. This paper should be cited here.

page 9, line 16: this is confusing and should be rephrased "Due to many of the IO measurements being close to the detection limit ..."

page 13, line 25: "...offer a good..."

page 14, line 22: the Saiz-Lopez et al (2008) paper showed that snow recycling was required in their model of IO in coastal Antarctica, and so should be referenced here.

page 14, line 26: the discussion of acid anhydrides needs some more details (and references?).

page 15, line 21: "positively linked" implies some causality. You should consider a phrase like "closely correlated".

page 15, lines 22-24: this sentence is confusing and should be omitted. The correlation (or lack thereof) between IO and chl-a has not been established globally because there are so few IO measurements, almost all in coastal locations.

page 16, line 11: define what is meant by "sea ice concentration".

page 18, line 27: no comma

In several places, the abbreviation "cp." is used for "compare". It should be "cf."

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 33651, 2011.