

Interactive comment on “Tropospheric BrO column densities in the Arctic from satellite: retrieval and comparison to ground-based measurements” by H. Sihler et al.

Anonymous Referee #1

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This paper reports on a new method to retrieve tropospheric BrO columns from satellite observations in the Arctic. It appears to be a very good paper and a carefully done piece of work. The measurements are of high quality and the methodology is rigorous. Although quite technical, a lot of creative solutions are presented. In particular, the sensitivity filter is an elegant concept that nicely complements other recent studies on tropospheric BrO retrieval (mostly concerned by correcting for the stratospheric absorption). A very strong point of this paper is also the validation part, which shows unique comparisons of satellite and ground-based BL BrO columns in Arctic spring (during bromine explosion events). I believe this paper should be published, after ad-

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dressing minor points (see below).

Specific comments

- The paper could be improved for a better readability (especially section 2). Sometimes two consecutive paragraphs are not well linked, so it is difficult to have a smooth read. I also found the description part of the paper a bit long and a lot of mathematical formulas and symbols are not necessary. It would be better to spend few lines here and there to give more intuitive/physical explanations.
- Section 2.2. It would be good to say why 'O3 is chosen as a tracer for the stratospheric partial column' or give a reference.
- Section 2.3.1. 'It is noted, that the exact value of the BrO mixed layer height may differ in reality, but radiative transfer simulations showed its choice is not critical for the presented considerations' please specify that this is because of the high albedo conditions in Arctic
- Section 2.3.1: I found the explanation of the sensitivity filter a bit hard to understand. It would be good to explain (intuitively and in simple words) how the two measured parameters (Reflectance and O4) help to determine the AMFs.
- Table 3. It is hard to understand why these values have been used. Why these settings and not others? Are they representative enough?
- Section 2.3.2. Specify the wavelength used for the AMF500 calculation.
- Fig.11. I find the message very qualitative. It only shows that the sensitivity filter is not failing and does not give any limits of its applicability (subjective to the value of AMF threshold). I feel it could be expanded a bit.

Minor comments

- Some acronyms are not defined (e.g. LP-DOAS, CIMS,..). Please check the entire manuscript.

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- Fig1b. It would be better to express the O3 VC in Dobson units (the most used unit).
- Section 2.2.1: 'It turns out that the BrO/Bry concentration ratio, which is typically of the order of 0.6, is primarily depending on the stratospheric NO2 concentration'. -> 'It turns out that the BrO/Bry concentration ratio, which is typically of the order of 0.6 during daytime, is primarily depending on the stratospheric NO2 concentration'.
- Section 2.2.2. The description of the normalization of the BrO SCDs would be better placed in Section 2.1.
- I would skip Fig.3.
- In my opinion, Section3.4 is not necessary. It only repeats what has already been explained in the previous sections.

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