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Comment

Interactive comment on “New Aura Microwave Limb Sounder observations of BrO and implications for Br_y” by L. Millán et al.

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We thank the reviewer #1 for his thoughtful comments and suggestions that have helped to improve the paper. In addition to enacting changes he suggested, as detailed below, we have also made some additions and updates to the paper to improve clarity and underscore areas where our product represents a significant improvement on earlier versions.

In the course of making our modifications, we recognized that the averaging kernel plot (figure 3) was incorrect in the submitted draft. The earlier version indicated the new product had more sensitivity to the lower stratosphere than is in fact the case. In the light of this we have revised our estimate of the valid vertical range of the product to 10–4.6 hPa. We note that our estimate of total Br_y is unaffected by this update.

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However, the vertical range over which the new MLS observations usefully overlap with the other sensors is narrower, restricting the range of interest for the analysis shown in the comparison with other datasets.

Reviewer comments:

Major comments: 1/Zero order comparisons with SCIAMACHY and OSIRIS observations are used to assess the quality of the new MLS BrO dataset. As it is done, these comparisons are not relevant since the three datasets correspond to different local times. Given the strong diurnal variation of BrO in the stratosphere, it is a bit like comparing apples with oranges and therefore no conclusion can be drawn on the agreement between MLS and the two other satellite instruments. To investigate the quality of the MLS BrO dataset, the authors have to perform comparisons in the same photochemical conditions using a box model, as suggested on Page 334, lines 17-19. Such a quantitative validation exercise should appear in the revised version of the manuscript, otherwise the paper will not contain any relevant information about the quality of the new MLS BrO data.

To address this problem we used a tabulated photochemical model to map the SCIAMACHY and OSIRIS datasets to the MLS local time. The section 5.1 of the new version of the paper will explained the details.

2/A VSLS contribution to Bry of 5 ± 4.5 ppt is derived from MLS observations and model simulations. An uncertainty of 4.5 ppt is optimistic since it does not include the errors on the estimates of CH₃Br and long-lived halons and the errors induced by the model calculations. Previous studies (Sioris et al., 2006; Hendrick et al., 2008) showed that the uncertainties on rates of some key bromine reactions (BrO+NO₂+M → BrONO₂, BrONO₂ photolysis) can lead to an error of 10-20% on the inferred Bry. In the revised version of the manuscript, these errors have to be taken into account in the error budget of VSLS.

An uncertainty for the model calculations was added and included in the final Bry error

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estimate. See Section 6 of the new version for details.

Minor comments: Page 329, lines 15-16: the authors should explain the advantage(s) of using averaged temperature, O₃, and HNO₃ data from the standard algorithm in their retrieval.

It will be added that theoretically it is better to use the most realistic atmospheric representation available,

Page 330, lines 13-17: In Sect. 3.1, the different parameters related to the vertical resolution and information content of the MLS BrO measurements are described theoretically. The authors should also discuss the values of these parameters derived from Fig. 3.

Added in that section: As shown, the new BrO product has a vertical resolution of about 5 km between 10 and 1 hPa and the retrieval was not influenced by the a priori.

How do they compare with corresponding values from SCIAMACHY and OSIRIS ? Please discuss this point in the paper.

The vertical resolution will be mention in the introduction for each dataset.

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 325, 2012.

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