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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Characteristics of tropospheric ozone depletion events in the Arctic spring: analysis of the ARCTAS, ARCPAC, and ARCIONS measurements and satellite BrO observations" *by* J.-H. Koo et al.

Anonymous Referee #1

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Regarding the issue of the tropospheric BrO columns I would like to make the following comments.

The authors admit that there are large uncertainties in the determination of tropospheric BrO columns from satellite measurements. To circumvent this limitation the authors calculate six different tropospheric BrO columns using two different total columns from two instruments and three different approaches to obtain the stratospheric fraction. Unfortunately, these six products cannot be validated due to a lack of sufficient in situ data. As a result all six BrO columns are equally valid (or not) and the results of all

correlations should be shown in the manuscript (and not only in the supplement). This concerns Figures 2a, 3, 5d, and 9 and the discussion of these figures.

The authors further claim that the uncertainty in the BrO column is unimportant because they "do not introduce in the resulting tropospheric BrO columns an unphysical correlation with tropospheric ozone." However, this clearly needs to be demonstrated by the authors. At the moment a comparison of the correlations with O3 is shown in Figure 3 for only three out of the six BrO products. By the way, if the above statement is correct one correlation would be sufficient, so why does Figure 3 show 3 correlations? Taking only the 3 presented correlations the above statement sounds correct for Barrow and Zeppelin, but not for Alert. For example, at Alert for D-3 two correlations are negative and one is positive. However, overall the correlation coefficients for Alert and partly also for Zeppelin and Barrow are so small (below 0.4) that it becomes questionable if these correlation coefficients do have a scientific meaning. Probably, the small correlation coefficients only tell that there is no detectable correlation. If that is the case, Figure 3 for Alert would also support the initial statement. This would be an important finding. However, the authors need to present a serious estimate of the threshold for the correlation coefficient indicating a statistically significant correlation. The same is warranted for Figures 8 and 9 and S1 to S4.

Concerning the six different BrO products, the authors state that the "reasons for product difference could be the instrument sensitivity, retrieval algorithm, cloud interference, and the estimates of the stratospheric BrO columns." From this sentence I understand that the total BrO columns from OMI and GOME2 are significantly different at least for the analyzed period. Is that correct? If yes, this should be clearly stated in the manuscript.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 16219, 2012.