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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Impacts of bromine and iodine chemistry on tropospheric OH and HO_2: Comparing observations with box and global model perspectives" *by* Daniel Stone et al.

Anonymous Referee #1

Received and published: 17 November 2017

Stone et al. presents a study on the influence of tropospheric halogens on OH and HO2. The study is based on observations from the Cape Verde Atmospheric Observatory, a chemistry box model, and a global chemical transport model. Overall, the paper is well written and well suited for ACP. I recommend it being accepted following minor revision. I list specific comments and questions below:

1) Line 49: Le Breton et al (2017, doi: 10.1016/j.atmosenv.2017.02.003) have also presented measurements of BrO in the MBL, consider including a citation.

2) Line 224: What are the processes behind "Physical loss", is it deposition? If so, I suggest you state this explicitly. Is a lifetime of 24 hour reasonable?

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3) Line 244 to 253: The assumption of constant BrO and IO between 9:30 and 18:30 seems overly crude. As can be seen in Figure 3 of Read et al (reference given in manuscript), it takes approximately 6 hours for BrO and IO to raise from 0 to max. How would the results of the box model study change is more realistic assumptions about the diurnal cycle of BrO and IO are used?

4) Line 288 to 291: Please specify the additional bromine reactions that were added to the Parella mechanism.

5) Line 477-481: Consider extending the discussion of sea-salt debromination. Schmidt et al (reference given in manuscript) presented two simulations: one without sea salt debromination and one including it. The simulation that included sea salt debromination led to levels of BrO that appeared biased high compared to satellite observations, but reproduce the levels observed in the mid Atlantic MBL (see Figure S8 of Schmidt et al.). How would the result of the global model change is sea salt debromination was included? Also, consider commenting on the resent study by Chen et al (2017, doi: 10.1002/2017GL073812) that show that sulfur chemistry may provide a missing sink of Bry in the MBL to balance the sea salt debromination source.

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