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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Measurement and modelling of reactive halogen species over the tropical Atlantic Ocean" *by* A. S. Mahajan et al.

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Comments to Measurement and modelling of reactive halogen species over the tropical Atlantic Ocean S. Mahajan et al. ACPD 2009

I like to congratulate the authors to this manuscript which is a very useful supplement of the RHS observations at Cape Verde Island presented from Read et al. 2008. Not only the presentation of all measurement data, but also the extensive analysis and modelling, can enhance our understanding of the involved processes. I have a view minor comments (see below), which can hopefully improve the manuscript. I hope they can be involved in a revised version.

1. p. 24283 l. 5 "...while over the last three decades bromine and iodine chem-

istry have been shown to cause O3 depletion events (ODEs) in the polar tropospheric boundary layer (BL) in the Arctic and Antarctic (e.g., Bottenheim et al., 1986; Barrie et al., 1988; Kreher et al., 1997; Tuckermann et al., 1997; Wessel et al., 1998; Frieß et al., 2004; Jones et al., 2006; Saiz-Lopez et al., 2007a)."

Please separate BrO, IO and Arctic and Antarctic clearly, as until now no publication reliable demonstrate the observation of IO in the arctic!

2. 24284 l. 10 "In the mid-latitude MBL, BrO has been positively detected only at three coastal locations: Leser et al. (2003) observed variable levels around the Canary Islands peaking at 2.4 ppt, Saiz-Lopez et al. (2004) saw post sunrise peak levels of _6 ppt with an average of 2 ppt over the day at Mace Head, Ireland, while Mahajan et al. (2009a) reported elevated BrO mixing ratios peaking at 7.5 ppt in the semi-polluted coastal environment at Roscoff, France."

& 24289 l. 15 "...no studies have been performed in the tropical remote MBL and to our knowledge these are the first measurements of reactive iodine species (RIS) over the tropical open ocean."

Close to the Cape Verde measurement site, near the African upwelling region, MAX-DOAS BrO and IO observations were performed in 2007 (Martin et al. 2009). The highest observed concentration of 10.2 ppt BrO is reported, but no IO above the detection limit of 0.77ppt could be found!

3. 24287 l. 21 "Figure 2 shows the variation of BrO and IO with wind speed."

Why a correlation to wind speed is given, even if no correlation to the wind speed is expected from the explained processes, but no correlation to wind direction (or even back trajectory) is shown. Also if the author state that there is no dependency, this correlation plot would be more important to convince the reader.

4. 24287 l. 24 "In the case of BrO, all measurements were made when the wind happened to be from the prevailing north-easterly direction, and hence a correlation

analysis cannot be made. "

Why do you not continuously measure all halogen trace gases? Note that also the maximum BrO values were observed for the same wind direction from Martin et al. 2009.

5. 24288 l. 12 "Box model calculations for conditions seen at Cape Verde show that to sustain an average [BrO] of $\sim$2.8 ppt, there needs to be a total gas-phase bromine loading of $\sim$10 ppt."

Can the authors please state on what these calculations are based?

6. 24289 l. 1 ". . .indicating that the observed BrO levels can satisfactorily be explained through emissions from sea-salt aerosol."

From the authors conclusion the BrO is emitted from sea salt aerosol, and should therefore be independent from the location in the marine boundary layer. Or at least no strong spatial variation should arise. How can the authors than explain, that on ship MAX-DOAS measurements (Martin et al. 2009, Leser et al. 2003), high local variations of BrO concentration is observed in this area?

7. 24289 l. 21 "Hence, it is probable that these waters represent a large area of increased iodine release. A recent study by Martino et al. (2009) has suggested that deposition of O3 on the ocean surface could lead to the emission of iodocarbons in the presence of dissolved organic matter, which on photolysis could contribute to RIS in the MBL. Fluxes of iodocarbons measured over the open ocean close to the measurement site, as a part of the RHaMBLe campaign, confirm their presence (Jones et al., 2009) and indicate that they could indeed act as a source of RIS in the remote MBL."

How can the author explain that IO is only observed at Cape Verde Island with LP-DOAS and not over the ocean with MAX-DOAS (Martin et al. 2009 and other studies)? If the assumed process for Iodide release is based on sea water surface, it can not explain this difference!

8. 24293 "The total column abundance predicted by the model is 9.7$\times$1011 molecules cm$-$2, which is below the upper limit of 2$\times$1012 molecules cm$-$2 for current satellite measurements (Schönhardt et al., 2007)."

These values make the expression that satellite measurements can almost detect these concentrations. But in reality the satellite detection limit over the ocean is much worse, especially in the lowest layers due to: the low surface albedo over the ocean, typical cloud cover, no homogeneous distribution of trace gas over the measurement pixel, low temporal and spatial resolution!

New References: Martin, M., D. Pöhler, K. Seitz, R. Sinreich, and U. Platt; BrO measurements over the Eastern North-Atlantic; ACP 9, 9545–9554, 2009.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 24281, 2009.