Response to interactive comments by J.C. Gomez Martin:

The comments of the Referee are printed in usual black font and our answers are printed in **bold font**. New passages of the revised manuscript are printed in ***italic***.

Comment 1

J.C. Gomez Martin: Großmann et al. report interesting MAX-DOAS measurements of iodine monoxide in the Western Pacific, complemented by GC/MS halocarbon measurements. These are consistent with similar measurements carried out by Mahajan et al. in the Eastern Pacific. The two studies now in ACPD have increased the understanding of iodine chemistry in the remote oceanic MBL, although the conclusions are perhaps more in line of iodine playing a less important role in the Pacific Ocean MBL than previously speculated. The results from both cruises also seem to be inconsistent with SCIAMACHY IO column maps over the Pacific.

Authors: The authors thank Dr Gomez Martin for the above summary and the comparison between the two ship campaigns in the Eastern and Western Pacific.

However, for a direct comparison one has to keep in mind that the distance between the two probed locations in the Eastern and Western Pacific is quite far, i.e. approximately 8000 km. Furthermore, the waters off coast Peru are a biologically active region due to upwelling in contrast to the Western Pacific.

Comment 2

J.C. Gomez Martin: I have a few suggestions for improving the discussion of the data.

Authors: The authors are grateful for the helpful comments to improve the discussion of the data. In the following, all comments by Dr Gomez Martin are addressed separately.

Comment 3

J.C. Gomez Martin: First, regarding the investigation of sources of reactive iodine by correlation with oceanic and atmospheric physico-chemical variables, I would suggest using total reactive iodine (IOx=I+IO) rather than IO for performing this analysis. IO may not be a good proxy of IOx, since the IOx partitioning between I and IO depends on O3, and O3 varies very significantly along the cruise track. Since atomic iodine can be confidently modelled (its main fate in a clean environment is reacting with O3), it is easy to derive IOx as measured IO + modelled I. A back of the envelop calculation using the data in figure 7a and 7d suggests that at the equator the daily average [I]/[IO] ratio could be higher than 3, with [IOx] $\approx$ 4 pptv, while at the start and end of the cruise [IOx] $\approx$ [IO]$\leq$1 pptv.

Authors: Yes, IO_x may be better suited than IO for assessing the

required additional I_x emission. Comparing however, measured IO plus modelled I to modelled IO plus modelled I is essentially the same as comparing measured and modelled IO.

Comment 4

J.C. Gomez Martin: O3 varies very significantly along the cruise track (from 40 ppbv to below detection limit, which I assume is 1.5 ppbv rather than 15 ppbv as stated in the text)

Authors: Indeed, our statement on the the detection limit of the ozone sonde is wrong. We now state in the revised manuscript on page 27493, line 5: *In the latitude band between 15°N and 8°S, ozone mixing ratios measured by in-situ O_3-sondes (Markus Rex, AWI Potsdam, personal communication) dropped to values close to zero near the surface.*

Comment 5

J.C. Gomez Martin: Note that the maximum daily average IO VMR reported by Mahajan et al. is 0.9 pptv, corresponding to IOx $\approx$ 1.2pptv (this needs to be corrected in table 1)

Authors: We thank Dr Gomez Martin for this important correction. The value has been changed in Table 1 in the revised manuscript.

Comment 6

J.C. Gomez Martin: Also, apart from SST and RH, nothing is said about correlation with other meteorological variables or ocean physical variables which could have an influence on the ocean surface iodine source, such as wind speed, salinity, DOM, etc. An interesting observation in the Eastern Pacific study by Mahajan et al. was a positive correlation between IOx and salinity. Even though it looks like salinity was not measured in the TransBrom cruise, there are in situ salinity measurements available from the drifting floats of the Argo program which could be used for such comparison. Interesting for comparison with on-going laboratory investigations would be to report the slope of linear correlations between IO or IOx and SST and Salinity.

Authors: Yes, there are several other parameters which could have influenced the marine iodine source, e.g. wind speed or marker pigments for cyanobacteria (Zindler et al., 2012). Unfortunately, no salinity data is available from the TransBrom cruise. The salinity from the ARGO float data set has several data points in the time frame and vicinity of the TransBrom cruise, but they do not match well enough in order to support a tight and convincing correlation with daily averaged IO mixing ratios. The following text and table were added to the revised manuscript:

Table 1: Overview of the correlation of different parameters with IO mixng ratios (daily averages).

correlation parameters	number of data points	Pearson correlation coefficient	slope of linear correlation
CH_3I [ppt]	7	0.25	0.150
CH_2ClI [ppt]	10	-0.22	0.023
CH_2BrI [ppt]	3	-0.91	-5.320
CH_2I_2 [ppt]	8	0.15	0.220
Chl-a [mg/m^3]	14	-0.70	0.001
zeaxanthin [mg/m^3]	14	-0.42	-0.005
divinyl chlorophyll-a [mg/m^3]	14	-0.43	-0.004
O_3 [ppb]	12	0.47	0.009
humdity [%]	14	0.60	0.021
SST [°C]	14	0.71	0.076
windspeed [m/s]	14	-0.31	-0.031

- **page 27492, line 27:** ***Table 1 shows an overview of the different parameters that were correlated with the daily averaged IO mixing ratios. Except for*** CH_2BrI***, the daily averaged iodocarbons only indicate a weak correlation with daily averaged IO VMR (***$R \leq \pm 0.25$***),*** **supporting the idea that organic iodocarbons were not the main source for reactive iodine in the MBL.** ***Note that for*** CH_2BrI ***only three data points were available. Hence, a reliable correlation could not be provided.***

- **page 27493, line 4:** ***Zeaxanthin and divinyl chlorophyll-a are marker pigments for cyanobacteria (Zindler et al., 2012). Since both marker pigments only show a weak anti-correlation with IO VMR (***$R = -0.42$***,*** $R = -0.43$***), they may also not serve as an appropriate indicator for IO.***

- **page 27493, line 20:** ***Moreover, the Pearson correlation coefficient of windspeed and IO amounts to*** $R = -0.30$ ***(see Table 1) indicating that a correlation e.g., during the tropical storms was not observed.*** **The relative humidity** ***and wind speed were*** **recorded by the weather station of the RV Sonne, whereas the SST was measured by a factory calibrated temperature probe in surface seawater taken from 5 m depth in the hydrographic shaft of the RV Sonne.**

Comment 7

J.C. Gomez Martin: Finally, it would be informative to have some model estimations of how much ozone is depleted by the IO (and not shown BrO) levels reported, and if IO would be actually an important oxidant at these levels in the open ocean MBL.

Authors: The photochemical model MISTRA used in this manuscript has already been used for modelling the halogen chemistry around the Cape Verde Islands in the tropical Atlantic Ocean (Sommariva and von Glasow, 2012). IO was measured at the Cape Verde Islands by Read et al. (2008) and Mahajan et al. (2010) with similar values compared to this manuscript. According to these model calculations, iodine photochemistry causes an additional ozone loss of 0.5 - 1 ppb/day. Although the main halogen species destroying O_x was bromine (30 - 40 % of halogens net O_x loss), the contribution of iodine to halogens net O_x loss still accounts for $\approx$ 20 - 30 %.

Bibliography

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