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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The contribution of oceanic methyl iodide to stratospheric iodine" *by* S. Tegtmeier et al.

Anonymous Referee #2

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The paper describes a two way approach to constrain stratospheric Iy by (1) estimating the vertical profile of CH3I based on ship-observations from various recent campaigns, and (2) comparing these estimates with recent aircraft observations. The manuscript is well within the scope of ACP, and warrants publication after the following issues have been addressed.

Comments:

1) the title 'The contribution of oceanic methyl iodide to stratospheric iodine' is somewhat misleading, as no estimate for the contribution of CH3I to total iodine in the stratosphere is actually presented. The manuscript would benefit from discussion about what is known about the different reservoirs of iodine in the stratosphere, and existing con-

straints on stratospheric Iy, as well as discussion on what measurements (species, altitude ranges) are most likely to provide a meaningful constraint on stratospheric Iy.

2) It is not correct that 'Investigations of inorganic iodine species, in the form of iodine monoxide (IO) or iodine dioxide (OIO), in the lower stratosphere reveal only undetectably low amounts.' The data by Wennberg et al. (1997) claim detection of IO in the stratosphere. Recent field observations of free tropospheric IO further indicate that these concentrations may actually be lower limits (Dix et al., 2013).

3) The authors say 'In order to quantify the contribution of CH3I to the stratospheric Iy budget observations of CH3I and IO with a good global coverage would be necessary. Such observational evidence of global upper air iodine abundances does not exist so far.' There is certainly a need for more observations. In addition to references in comment #2, a missing reference is Puentedura et al. (2012). The increasing experimental evidence suggests consistently that a hemispheric IO background is likely present, and on the order of 0.1-0.4 ppt IO may reside in the global free troposphere. Inorganic iodine is thus likely of similar order of magnitude as the estimates of organic iodine in Fig. 5.

4) It is currently unclear whether the primary source of iodine from the ocean to the atmosphere is in organic or inorganic form. Further, heterogeneous recycling on aerosol surfaces may extend the atmospheric lifetime of inorganic iodine beyond that of organic iodine precursors. There is increasing evidence for a source of I2 and HOI from heterogeneous reactions at the ocean surface (Carpenter et al., 2013) and on aerosols (Dix et al., 2013). This information is currently missing in the manuscript.

5) Uncertainties about the lifetime of inorganic iodine, together with the variability of CH3I in upper air pose a major uncertainty in estimating stratospheric Iy. This should be clearly stated.

References:

Carpenter et al. (2013) Atmospheric iodine levels influenced by sea surface emissions of inorganic iodine. Nature Geoscience, DOI: 10.1038/ngeo1687

Dix, B. et al. (2013) Detection of iodine monoxide in the tropical free troposphere, P. Natl. Acad. Sci. USA, 110, 2035–40, doi:10.1073/pnas.1212386110.

Puentedura O., et al. (2012) Iodine monoxide in the north subtropical free troposphere. Atmos. Chem. Phys. 12(11), 4909–4921.

Wennberg P.O. et al. (1997) The atmospheric column abundance of IO: Implications for stratospheric ozone. J. Geophys. Res. Atmos. 102(D7), 8887–8898.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 11427, 2013.