

## ***Interactive comment on “Origin of oxidized mercury in the summertime free troposphere over the southeastern US” by V. Shah et al.***

**Anonymous Referee #2**

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This is an interesting complex paper that is suitable for ACP. It would be useful for the Hg community for the authors to provide discussion regarding the data obtained with cation exchange membrane, and the detection limit when using this method instead of the pyrolyzer. The authors should discuss whether the data was from the cation exchange membranes or pyrolyzer when discussing the flights, since use of membranes are considered by the authors to be better than the pyrolyzer due to relative humidity. It would be nice to know if the  $1\sigma$  improved, and how this influenced the method detection limit. Since 2 different methods were used it is important to discuss specific data. The authors seem to focus on Hg-Br related reactions. Why do they think these are the most important focus on? It seems air traveling in the free troposphere/stratosphere could have other things to react with (i.e. Ozone) and the authors are stabbing at

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the chemistry to make the model fit the observations It might be useful to present the range in % GOM in air relative to TGM for both the pyrolyzer and the cation exchange membranes in some cases.

The authors might want to add the caveat that without understanding the chemical forms of GOM in the air modeling is speculative. They have no way of knowing if the form is a HgBr compound, and are essentially changing reaction mechanisms to get the rates they think are sufficient.

Pg 41 line 10 change are to were

Pg 54 line 14 no significant figures on pg m<sup>-3</sup> Line 15 remove The

Pg 55 remove The. It there anyway to compare data collected with cation exchange membranes with that collected using pyrolyzer for a specific comparable air mass? For RF 16 pg 61 were these measurements made using the cation exchange membranes or the pyrolyzer?

For Table 3. For these data what happens if you use the cation exchange membrane data only for the different categories.

In the figure captions the authors should describe the symbols for color and greyscale.

Figure 7 Some of the air appears to have moved in the boundary layer across S California could this influence your measurements at higher elevation? Same question for Figure 6

For Figure 2 the authors should make the measurements made with the cation exchange membranes a different symbol.

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Interactive comment on Atmos. Chem. Phys. Discuss., 15, 26839, 2015.

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