

Interactive comment on “Observation of the exhaust plume from the space shuttle main engine using the Microwave Limb Sounder” by H. C. Pumphrey et al.

Anonymous Referee #1

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This is an interesting paper and it is worthwhile to document MLS's capabilities in detecting plumes. I do have several comments- none too dramatic, although I think some more work is called for to complete the study as well as clarifying the presentation. I ended up suggesting "major revisions", but the boundary between "minor" and "major" is fuzzy in this case.

I do think they could put more effort into isolating which detections are plumes from specific launches. For example, in Section 5 they speculate about points near French Guiana and/or a point over the Caspian Sea. Why should this be a mystery? Was

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there a launch or not? Similarly, the summer high latitudes- I would think its relatively easy to distinguish between natural H₂O upwelling and H₂O deposited from above by plumes. In the latter case the mixing ratio should increase with altitude; in the former case (the standard one), it should decrease. They should also at some point list or state how many shuttle launches occurred during their period of operation and which ones they saw and the dates. Some of this information is in Figure 5 but it would be easier for the reader if the authors backed it out for us.

I am a bit bothered by the presentation style- it comes across as a detective story “first we did this and then we had to go back and do this”. This roundabout approach is fine for actually conducting the work (science is often conducted in this way), but that messiness doesn't read well for a final archival report. The switching back from level 2 to level 1 data is confusing. I thus think Figures 3 and 1 should be switched. Start with the basic radiances (Figure 3), show how they do their search and set their detection criteria and then Figures 1 and 2 can be examples of one such detection.

Specific comments:

I am not troubled by their relatively low sensitivity to the plumes since their instrument wasn't designed for this purpose. However, as it reads it's a bit ambiguous as to the reason. It seems obvious to me that they aren't scanning high enough in the atmosphere; however, they also imply it isn't sensitive enough. It would be useful for them to distinguish between these two reasons and to put this in their conclusions.

Introduction: page 3973, bottom paragraph: They should spell out GUVI and SABER. Also make it clear that GUVI was nadir imaging.

Section 5, 3rd paragraph, line 5: The estimates of plume speeds were first introduced by Siskind et al [2003] who should probably be cited along with Stevens et al.

Also for the Conclusions, they should state that their preliminary estimates of plume speeds agree with the earlier SABER, GUVI estimates.

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It would be easier to decipher the figures if they separate panels were defined as (a) and (b) and referred to as such in the caption.

Is there a reason they can't simply plot pressure in the upper panel of Figure 1? Log-pressure isn't standard.

Interactive comment on Atmos. Meas. Tech. Discuss., 3, 3971, 2010.