

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 #2

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This paper is an elegant analysis of Microwave Limb Sounder water vapor data that reports new detections of space shuttle main engine plumes in the upper atmosphere. These observations are significant as they not only add to the existing collection of shuttle plume observations but they can also lend new insight to their observed rapid transport in the upper atmosphere. The paper is clearly written and candid about the limited capabilities of MLS in detecting rocket/shuttle plumes, nonetheless suggesting that a similar instrument better designed to this problem could be more effective.

I have only two major criticisms. The first is the brief discussion on the transport at the

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top of page 3978 (lines 1-5). First of all, the authors need to be clear whether their calculations are for total transport (zonal and meridional) or just meridional transport. Stevens et al. (2005) reported the meridional transport speed so we must assume that this is what the authors are calculating since they compare to this work but they need to say so. Secondly, the authors need to be explicit on the starting point of the plume deposition for their calculations which is on average slightly north of the Kennedy Space Center near 33 N and 75 E for the altitudes between 100-115 km (Stevens et al., 2005). It would in fact be useful to draw this latitude as a dashed line perhaps onto Figure 5. Finally, since Siskind et al. (2003) has shown that the transport is faster than predicted, it would be useful to know what time of year the fastest transport might be found. For example, if fast meridional transport preferentially biased to solstice during the PMC season they should add this to the discussion on p. 3978.

The second major criticism is the lack of a table summarizing the observations. If MLS has observed 50% of launches, looking at Figure 5 there are about 10 shuttle plumes detected. It would be useful to include a table showing the launch date/UT of these launches, the date/UT of the unambiguous detections, the time from launch of the detections, the latitudes and longitudes of the detections and the relative observed brightnesses of the plumes. The calculated meridional velocity of each of them would also be useful to know. That way others studying their data can compare with these MLS observations.

Some more minor comments:

- 1) Please note that the shuttle has three main engines so that “main engine” should be plural in the title.
- 2) Pg. 3972, line 23. Please include at least one reference following the description of the annual cycle of water vapor.
- 3) Pg. 3973, line 6. “. . .but a similar increase. . .” should be “. . .but a similar increase in frequency. . .” to be explicit.

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4) Pg. 3976, 1st paragraph. The authors should give the altitude region over which they average here.

5) Regarding other launches, a useful website listing past launches worldwide is <http://spaceflightnow.com/tracking/launchlog.html>

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