

Interactive comment on “Spatial Heterodyne Observations of Water (SHOW) from a high altitude airplane: Characterization, performance and first results” by Jeffery Langille et al.

Anonymous Referee #3

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This paper describes the details of measuring and retrieving water vapor from the SHOW instrument on a high altitude aircraft, including some first results compared to a nearby radiosonde profile. The development of the SHOW instrument is an exciting capability for the research community. Most of the paper involves characterization of the instrument and measurement details on the aircraft and in the laboratory. Overall, the paper provides a comprehensive explanation of these aspects, although I am not an expert on any of these details and cannot provide critical comments. Hopefully these will come from other reviewers. The comparison of the SHOW retrieval and the single radiosonde water vapor profile (Fig. 19) looks quite reasonable, although I question why the uncertainties are so small in both measurements (see below). Overall the

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paper is clearly organized and well written, the figures are reasonable, and the topic is appropriate for AMT. I only have a few minor comments to contribute:

- 1) The uncertainties in Fig. 19 seem small to me. The radiosonde measurements (Vaisala RS41) probably makes accurate measurements (to a few %) in the upper troposphere down to 10-20 ppmv, but there are larger uncertainties for lower H₂O amounts at higher altitudes. Where do the uncertainties (error bars) shown in Fig. 11 come from? The 1 ppmv uncertainty quoted here may be on the small side at upper levels. Likewise, the uncertainties in the SHOW retrieval look remarkably small, given all of the uncertainties and corrections discussed in the paper. I have to say this is a relatively minor point, given the quite good agreement in Fig. 19.
- 2) Some definitions need to be included: N (page 8, line -4 and elsewhere), and DN, PRNU (p. 11, Table 2 and elsewhere).
- 3) Figure 9a reproduces quite poorly, and no need to have a black background.

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