

Interactive comment on “A two-channel, tunable diode laser-based hygrometer for measurement of water vapor and cirrus cloud ice water content in the upper troposphere and lower stratosphere” by T. D. Thornberry et al.

T. D. Thornberry et al.

troy.thornberry@noaa.gov

Received and published: 11 November 2014

We thank the reviewer for their suggestions regarding improvements to the manuscript. The reviewer's comments were helpful in identifying unclear aspects of the paper and we have made changes to the text and figures according to the reviewer's suggestions as outlined below.

Response to specific comments:

C3685

1) Figure/Table captions: I recommend to always explain abbreviations in figure captions so that each figure can be understood without reading the text in parallel.

Text has been added to the figure captions to expand many of the abbreviations used.

2) Figure 1: could you show the sub-enclosure here? And it would be good to have annotations of the main components in the figure.

The instrument model has been modified slightly to increase the visibility of the optical cell sub-enclosure and annotations added to direct the reader to specific components within the instrument including the optical cells and sub-enclosure heaters. We considered adding a separate model of the sub-enclosure but found that it did not provide significantly more information.

3) Figure 3: also here some annotations -in one panel- would make it easier for the reader to understand the construction, e.g. on which side the inlet/laser/detector and outlet/mirror port is (especially since it is conversed in comparison to figure 2)? Where is the lens to collimate the beam? and would be good to sketch in the laser in the same way as in figure 3 (in the upper panel?).

Annotations were added to Figure 3 to indicate the locations of the laser, detector, mirror and lens.

4) Figure 8: Would be good to state that the figure refers to the strong line.

Text was added to the figure caption stating that the signals shown are from the strong absorption line.

5) 2.5 Inlets: I miss to see/know where on the aircraft fuselage the inlet is mounted, since this is important for its sampling performance (a photo ?). A description is given later in section 3.2 'Ice Water Content Measurement Uncertainty', I think it would be better already introduced here.

An additional figure was included (Fig. 6, existing figures renumbered) presenting

C3686

a photo of the Global Hawk during the ATTREX mission showing the NOAA Water inlet on the starboard side of the fuselage with an inset photo showing the instrument installed in the instrument bay.

6) 2.5.2 Total water inlet, last lines of the section: later in section 3.2 it is described how the ice crystal size distribution influences the calculation of the IWC. This could be discussed already here, or cross-references should be given between these two paragraphs.

A general statement on the sensitivity of the uncertainty in IWC determination to uncertainty in the cirrus particle size distribution was added to the end of section 2.5.2. The more quantitative statements were left to section 3.2.

Interactive comment on Atmos. Meas. Tech. Discuss., 7, 8271, 2014.