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Comment

## ***Interactive comment on “A fiber-coupled laser hygrometer for airborne total water measurement” by S. W. Dorsi et al.***

### **Anonymous Referee #2**

Received and published: 25 October 2013

General remarks:

The paper describes the development of a second generation of a fiber-coupled laser hygrometer (CLH-2) for airborne measurements. The instrument has a new and compact design to be installed and flown in a standard underwing canister of any aircraft in order to measure total water vapor in the range of 600–25000 ppmv at pressures of 200–1000 hPa. The instrument is a further development of the CLH-instrument as reported earlier by Hallar et al., 2004 and Davis et al., 2007b. In itself the CLH-2 hygrometer is a new design of a compact hygrometer and through its standardization also very suitable for different kind of airborne applications. In so far the present paper is certainly appropriate for publication in AMT. However, the real new contents are the parts describing the CLH-2 as an airborne water vapor detector. The parts on the total water vapor are

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not really new and more or less a repetition of earlier publications by Hallar et al., 2004 and Davis et al., 2007b. The authors have reported the instrumental design, calibration procedures and uncertainty estimations in a very good way. Therefore I would certainly rate the paper to be published in AMT but only after restructuring and reducing the rather large sections describing and discussing total water vapor content (TWVC) and cloud water vapor content (CWC) which actually don't add any new information and thus should not really be in the focus of the paper.

#### Specific Remarks:

The real new content of the present manuscript is the further development of the CLH as a gaseous water vapor detector and therefore this should be the focus of the paper. Certainly the capabilities of the CLH-2 are to measure total water vapor when combined with a proper inlet system. But this option has been reported already before by Hallar et al., 2004 and Davis et al., 2007b such that it should only be a minor part of the paper. Therefore, I strongly recommend to omit or reduce most of the TWC, CWC etc. because it is adding nothing original or new to the paper. Examples are: Footnote 1 (Page 7357-7358), Page 7364, Restructuring Chapter 4: uncertainty of CWC should only be short by just referencing to appropriate literature.

The CLH-2 has been designed to measure direct absorption and not 2f-techniques. This immediately raises the question: In how far the CLH-2 can also be used as an absolute measuring hygrometer which don't need any calibration?. The authors should address this aspect and discuss it, whereby an uncertainty analysis in this perspective would be most appropriate. The authors reported that the CLH-2 has been flown on the NSF/NCAR Golfstream: Reporting of the results of the performance of the CLH-2 would contribute substantially to the present paper.

In addition two aspects to be considered:

a.) Change Title of the paper: "A fiber-coupled laser hygrometer designed for airborne measurements"

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b.) Abstract (Page 7346), Line 4-5: “This compact instrument has been flown. . . .” is misleading and should be omitted because nothing in the present manuscript reports on this. In the abstract also more quantitative information on the performance characteristics of the new CLH-2: measurement range of water vapor, time response, pressure range.

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