

## **Water vapor observations up to the lower stratosphere through the Raman lidar during the MAido Lidar Calibration Campaign,**

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### **General Remarks**

The manuscript describes the description and testing of a water-vapour lidar system with impressive performance and clearly deserves publication. The field of lidar sounding of UTLS H<sub>2</sub>O is scientifically highly relevant and one of the main current-day technical challenges. Before publishing the manuscript in AMT I recommend a number of mostly technical or style-related changes.

### **Details**

- (1) Abstract, line 5: You should first introduce the need for validation and the other objectives before mentioning the campaign!
- (2) System description: Add manufacturers of the components.
- (3) P. 10371, line 9: "Raman Q branch"
- (4) P. 10371, lines 17-18: Fig. 1: Shift the introduction of the figure to the beginning of the system description (e.g., to P. 10370, around line 5)
- (5) P. 10374, lines 14-16: This sentence is a little bit confusing. One objective is announced, but several goals are mentioned. Do you mean "by improving"? Still, validating is an objective differing from optimizing.
- (6) P. 10375, line 23: I think you should address the overall "detection efficiency" here.
- (7) P. 10378, lines 2-3: A quantification of the biases does not necessarily imply an optimization of the system. Please, rephrase! For instance: " Due to the very low H<sub>2</sub>O Raman signal received from the stratospheric a number of of known biases must be taken into consideration."
- (8) P. 10379, line 9: "the water vapour signal"
- (9) P. 10379, line 11: "to fluorescence of components"
- (10) P. 10379, line 15: Replace "Mie" by "particle".
- (11) P. 10379, line 23: I think the reader has some interest in learning who manufactured the filters resulting in these exceptional OD values!
- (12) P. 10380, line 9: Why is this noteworthy? You did it, and the results is obvious.
- (13) P. 10381, line 26: Vertical resolution is defined rather differently by different groups. How is dz defined in your case? dz looks much like a range bin size.
- (14) P. 10382, line 14: I cannot find C in the formula! See also P. 10383, line 2.
- (15) P. 10384, line 9: "work shows"
- (16) P. 10384, lines 11-12: Do you mean "a movable support that is shifted across the top ..."? "Removable" looks somehow trivial! Also: "and directly illuminates"

- (17) P. 10384, line 19 I do not understand "we provide to substitute". Do you mean "we substituted"?
- (18) P. 10389, lines 10-12: The role of the mountain-related circulation should be mentioned.
- (19) P. 10394, lines 6-8: These objectives are not new. Here (in the Conclusion section), one would expect a statement on how well the goals were met. At least you should add such a statement, or reformulate the sentence.
- (20) P. 10394, line 17: You could emphasize "Most importantly, the absence".
- (21) P. 10396, line 9: Replace "error" by "uncertainty".
- (22) P. 10396, line 16: "could attest" suggests that you are not really sure about this! Better: "suggests".
- (23) Fig. 1: Is 1200 mm the diameter or the focal length?
- (24) Fig. 3: "vertical resolution" is not properly defined. I think you mean the number of bins used.

## **Style**

- (1) P. 10364, line 3: Replace "is devoted to" by "will".
- (2) P. 10365, line 5: "thus, "
- (3) P. 10365, lines 9 and 12: Replace the first "to measure accurately" by (e.g.) "to quantify".
- (4) P. 10365, line 12: "the UTLS"
- (5) P. 10365 line 16: "suffer from the abundance"
- (6) P. 10365, line 18, "the lidar technique"
- (7) P. 10366, line 1: "The acceptance of the Raman lidar approach within NDACC"
- (8) P. 10366, line 5: "insures"
- (9) P. 10366, line 6: "Other work, in part based"; not all these systems have been fully approved by NDACC!
- (10) P. 10367, line 21: Either "by the Network for the Detection of Atmospheric Composition Change" or "by NDACC" (without "the").
- (11) P. 10369, line 25: I think you did synchronize the pulse! Better: "were synchronized".
- (12) P. 10369: "to ensure"
- (13) P. 10370, line 1: What does "wavelength-dedicated" mean? "wavelength-specific", "wavelength-separating", "two-wavelength", ....?
- (14) P. 10370, line 20: "The spectral separation of the backscattered radiation"; "firstly": where is "secondly"?
- (15) P. 10371, line 12: "in front of the photocathode".
- (16) P. 10371, line 22: "The data-acquisition electronics consist"
- (17) P. 10373, line 10: "the Saastamoinen"; "is, thus, converted".
- (18) P. 10373, line 25: "1200 g"

- (19) P. 10374, line 17: I would prefer to see "signal-to-noise" ratio although I am aware that detailed hyphenation has become rather rare, which is also the case throughout this paper.
- (20) P. 10374, line 18: "parasitic"
- (21) P. 10375: line 26: "columns"
- (22) P. 10376, line 11: "to increasing or decreasing"?
- (23) P. 10376, line 14: Replace "the two" by "both".
- (24) P. 10376, line 15: Into what are the two lasers coupled?
- (25) P. 10377, line 25: "nitrogen"
- (26) P. 10379: line 20: The abbreviation OD must be explained.
- (27) P. 10379, line 25: "let us consider Fig. 2".
- (28) P. 10384, line 17: "ratios"
- (29) P. 10384, line 22: "3 April, respectively"
- (30) P. 10385, line 23: "However, in the future"
- (31) P. 10385, line 25: Do mean "measurement"?
- (32) P. 10385, line 1: "Furthermore, the"
- (33) P. 10387, line 20: It is easier to read this sentence if you add "on 3 April" again.
- (34) P. 10388, line 22: " between 15:00 UTC on 11 April and 0:00 UTC on 12 April"
- (35) P. 10389, line 9: I could not find (Vogelmann et al., 2011) in the list of references.
- (36) P. 10389, line 21: Remove "far".
- (37) P. 10389, lines 25-26: "In Fig. 10"
- (38) P. 10391, line 15: "signal-to-noise"
- (39) P. 10396, line 20: "In particular, the"
- (40) P. 10396, line 25, line 28: "testing"
- (41) P. 10398, line 9: "Van Baelen"?