Review of the paper: Calibration instrument for the krypton hygrometer KH20

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Title: Technical Note: Calibration instrument for the krypton hygrometer KH20

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General comments

The paper describes a novel calibration method for a commercially available krypton hygrometer (KH20). The KH20 is a fast-responding hygrometer often used as part of flux measurement systems. It suffers from "scaling" of the magnesium fluoride windows of the sensor unit, thereby affecting the absolute humidity average but not the absolute humidity fluctuation.

The paper describes a method that involves changing the path length of the UV radiation used, with little change in absolute humidity, as opposed to fixing the path length and changing the absolute humidity. Changing the path length simulates a change in voltage at the receiving window.

Specific comments

1. p1697, lines 15-16: We have thought that use of an absolute humidity chamber during field campaigns is reasonably practical. The disadvantage of this method, compared to the variable path length method used in the present paper, is that the absolute humidity chamber method is time-consuming. I suggest that the disadvantages of the absolute humidity chamber method be presented.

2. p1702, line 5: The HMP45A is no longer available – I suggest specifying an alternative.

3. p1703, lines 6-20: Were the calibrations for scaled windows? More detail in relation to cleaning and scaling of the windows and its impact on calibration/calibration procedures is suggested.

4. p1708, Table 1. The correlation coefficient needs to vary for different numbers of paired measurements used in the calibration.

5. p1709, Table 2. In the Abstract, line 5, mention is made of the main application for calibration at high altitudes and low temperatures. And yet in Table 2, no mention is made of these low temperatures.

6. p1715, Fig. 6, The data points reflect a non-linear relationship between x and y (- ln *V* vs *X*). What basis was used to obtain the straight line depicted? For example, the last ten points could also be

used to obtain a straight line. Also, it would be important to justify why a non-linear relationship should not be used when the data points express this non-linearity.

Technical corrections

a. p1697, Eq. (1). In some cases, in the text and other equations – for example Eq. (4) – *X* is used instead of *x*.

b. p1697, line 25. absolute humidities.

c. p1698, line 13. Interchange the two references – chrononological order?

d. p1698, Eq. (2). The absolute humidity term needs to be included.

e. p1698, Eq. (2) and lines 15-21. The definition of *f*, used in Eq. (2), should appear earlier – at the end of the sentence on line 16.

f. p1698, line 18. longer

g. p1698, Eqs (3) and (4). The former has *x* (three places) and the latter *X*.

h. p1699, line 4. α not *a*.

i. p1699, line 5. fluctuation of the absolute humidity.

j. p1699, line 19. Suggest change

on the same order

to

of the same order

k. p1699, line 25 Suggest change

cm^{-1}, see Fig. 2.

to

cm^{-1} (Fig. 2).

l. p 1700, line 14. water vapour

m. p1700, line 26. Start a new paragraph at “The calibration procedure…”

n. p 1701, line 1. determined by varying the path length

o. p1701, line 14. Italicize K_o

p. p1701, line 17. which is much less

q. p1701, line 19. et al. (1993) not et al.(1993)

r. p1701, line 26. repeated using a variable dewpoint chamber.

s. p1701, line 5. instrument,

t. p1704, line 8. guarantees

u. p1704, line 23. Campbell Scientific

v. p1706, line 15. Bull.

w. p1706, line 20. Humidity

x. p1706, line 20. Upper and Lower Atmosphere

y. p1707, line 2. Methods of Measuring

z. p1707, line 3. Humidity in Gases

aa. p1707, line 15. Irrigation and Drainage Systems:

ab. p1707, line 16. Integrated Perspectives

ac. p1707, line 19. Control

ad. p1707, line 20. Industry

ae. p1707, line 24. Ultraviolet,

af. p1711. Ordinate: Absorption coefficient (atm at 298 K)$^{-1}$ cm^{-1}

Abscissae: Wavelength (nm)

X axis – use one decimal for x axis numbers

ag. p1712, Fig. 3 caption. and touchpanel PC