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Atmospheric Measurement Techniques Discussions

Interactive comment on "An inverse modelling approach for frequency response correction of capacitive humidity sensors in ABL research with small unmanned aircraft" *by* N. Wildmann et al.

M. Hamilton (Editor)

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Dear Authors,

I am inclined to agree with referee #2 in regard to the sections in which you describe the theoretical basis for the inverse approach that you take. Indeed, apart from the fact that you use a Laplace transform instead of a Fourier transform, your approach is essentially that of deconvolution; and as you have alluded in the text, this method is described in textbooks. The real advance that you have made is experimental, in that you have actually measured the step-response functions for the hygrometer, and

applied those step-responses, via the Laplace transform, to remove the instrumental response from the experimental data.

Thus I would like to see a) the sections that describe the model and dynamics better connected, b) the points in those sections, that I draw to your attention below, dealt with, and c) these sections shortened where possible, and where the parts that are omitted are covered by reference to a textbook. Note that if you shorten these sections some of the comments I make below will become redundant.

Comments on the manuscript:

page 3, lines 8,9; The word "distinct" is inappropriate. words that would be better include "better" or "more detailed".

Page 6, line 27; This reference to the product specification is inadequate, and ambiguous - it could be referring to a figure and table in this manuscript. Such a reference needs to be treated similarly to a journal paper.

Page 7, line 3; The sentence starting " Since the P14 ..." is confusing. I suggest breaking this into two and removing superfluous words such as "at the same time" and "assumptions".

Page 7, line 6; The sentence "The polymer thickness ..." does not actually say what I think it is intended to say, because it does not actually confirm that the company (?) said that it was 1 micron. In any case it is better to state the thickness and make a reference (in the reference list) to a private communication from the company.

Page 7, line 12; The reference in the text to AMOC is unclear. Who made this in-house?

Page 8, equation 2; the first line is superfluous as it has already been given as a stand-alone equation, and in the third line the left hand side does not need to be repeated.

Page 9, line 22; The sentence "This also applies ..." is problematic. Do you have a reference to support this statement that the sensor you use has been optimised in the

choice of polymer. If you mean simply that it shows a linear relationship then that needs to be clarified.

Page, 10, line 1; In figure 3, what temperature is kept constant? It really has to be the sensor temperature for the figure to make any sense, but it is worthwhile to say this, as initially this is confusing for the reader.

Page 10, equation 8; It is worthwhile to repeat the definition of the variable c here, in order to better connect this section with the foregoing sections.

Section 3.1; This section is problematic because you develop a one dimensional model, but then apply Gauss' theorem which is meaningful only in three or more dimensions. In a one dimensional model what does the surface S mean? I suspect that you can get to the result of equation 13 without referring to Gauss' theorem, which is only confusing here. Also in the context of equation 12 (i.e. Gauss' theorem) the averaging bar placed over "c" is unexplained. In equation 14, you introduce c_m without explanation. The reference to figure 4 is out of place - it needs to be much earlier.

Page 13, line 25; the sentence beginning "The sensor is presumed ..." needs rewording. The use of "flood" is odd, though I know what you mean! Better I think to say something like "We assume that the humidity around the sensor changes completely in less than 100 ms, based on ..."

Page 14, line 25; You do not need to be selling the Laplace transform approach! Please consider deleting this sentence

Page 16, line 5; The sentence beginning "The method described ..." is weak. You should assert that here you use the method of section 3. Also you should start a new paragraph for the sentence that begins "In Fig. 8 ...".

These issues, and those raised by referee #2, need to be addressed before this paper can be considered to be acceptable for publication.

regards, Murray Hamilton (Assoc. Ed.)

Interactive comment on Atmos. Meas. Tech. Discuss., 7, 4407, 2014.