Atmospheric
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Techniques

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Discussions

EGU

Interactive comment on "An Automated Method for Preparing and Calibrating Electrochemical Concentration Cell (ECC) Ozonesondes" *by* Francis J. Schmidlin and Bruno A. Hoegger

Anonymous Referee #1

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General comments

The manuscript can be divided into two parts. In the first part the authors describe the design of a digital calibration bench for ECC ozonesondes in use since 2007 at the NASA/GSFC/Wallops Flight Facility. In the second part the digital calibration bench is used to test Science Pump Corp. 6A ECC ozonesondes with two different sensing solution types. In the first part the digital calibration bench itself is good described. Preparation of ozonesondes using such a device is superior to a manual preparation in particular when a UV photometer as a reference is used. This description alone qualifies for a publication in AMT. With respect to the second part it is not clear to me

whether this part is only written to demonstrate the prospects of the bench as indicated e.g. at line 326 or to make valuable scientific statements. In a demonstration mode large portions, e.g. the BESOS discussion, can be omitted. For scientific statements the whole second part offers some potential for improvements, i.e. a better statistic and an error analysis. However, in total I recommend the publication of the manuscript after some minor revisions.

Specific comments

1. The title of the manuscript is dealing with the first part only. The title should address both parts in case the second part is not for demonstrations only.

2. As pointed out several times the aim of the digital calibration bench was to investigate the behavior of ECC ozonesondes and to compare different configurations in a consistent and resources conserving manner replacing e.g. dual soundings. Although the advantage of reducing subjectivity compared to the manual preparation is mentioned, a clear statement is missing, that the bench is used at the Wallops Flight Facility for routine soundings (since when?), too. In this frame, one can address the fact that such calibration benches would be of benefit in particular for the ozonesonde records at remote sites with frequent exchange of operators (neglecting the needed financial effort).

3. Line 108: What means "similar" to the MeteoSwiss version? Are there improvements?

4. Line 159: Please list manufacturer, sensor type, measurement principle of the flow rate measurement device. The same is desired for the UV photometer.

5. Line 207: I am sure that the authors do know that the cathode and anode cells have to be filled in the right sequence and that the instructions are accordingly. Please give a small hint.

6. Line 233: "After recording 170 nb of ozone for one minute". Fig. 2 (upper panel)

tells "10 minutes" instead. I assume the 10 minutes are true.

7. Line 271: I suggest: "... bench is limited to pressure and temperature ranges appearing at sea level."

8. Lines 282-298: In order to classify some statements in this paragraph the statistical background, i.e. the number of investigated sondes, is needed already here. E.g. the background current can be batch dependent, which should relativize the statement at lines 291-293.

9. Lines 335: I would agree to substitute "ideal" by "good", since a negative aspect is mentioned right after.

10. As already mentioned before, the second part suffers from a missing statistical error analysis. Presented are only averaged data without error bars (or single cases). Without knowing the statistical errors it is impossible to justify whether the number of underlying cases is sufficient large.

11. Lines 341-342: Why is only one example shown here? For all other cases the averages were shown.

12. Lines 369-370: A first answer would be the final calibration. However, again, it would be helpful to see the other examples.

13. Lines 393-424: Is this (incl. Fig. 5) a new analysis not conducted in the BESOS publication before? BESOS outcomes had been already discussed at lines 330-333. However, a comparison to JOSIE2000 is missing. Why?

14. Lines 430-433: I disagree with the statement "... measured virtually the same ozone partial pressure until reaching 70-80 nb ...". Obviously, the 0.5% sondes measure significant less ozone in the lower troposphere, too. A plot showing the differences in relative units would be interesting.

15. A last comment for the future use: The test environment is bound to the surface

conditions. One might learn more how to use the bench calibrations within these limits by combining them with subsequent dual flights or chamber experiments like JOSIE.

Technical corrections

1. Line 45: Please use SI units throughout the manuscript, i.e. mPa instead of nb for the ozone partial pressure.

2. Line 49: Write out the acronym BESOS in the abstract, too.

3. Line 88: Delete one "the".

4. Line 250-252: The steps are in ozone partial pressure. In Fig. 2. upper panel the steps are given in mixing ratios. What is actually used?

5. Fig. 2 lower panel: - The blocks with "TEI Generator" and "Hi Ozone" seems to be misleading. As far as I understood the ozone is generated inside the generator and not outside. I guess the TEI Generator has one outlet, which sends Zero Air, when the generator inside is off, and Hi Ozone, when the generator is on. In that case V3 would be needless (or somehow hidden in the generator). Or, the generator has two outlets, one for Zero Air and one for Hi Ozone. In that case V3 makes sense. What is true? - If you use a different color for Hi Ozone please explain it in the legend. - The blue arrows at the barometer and the two current sensors indicate that the computer is triggering these devices. Is that right? - The writing of the word "Exhaust" near ECC Sensor P2 should be shifted to the right to the real exhaust. - How does the information of the mass flow measurement go into the computer? Is there a wired control connection (please indicate it in the diagram) or is it manually transferred by the operator (please note it in the main text)?

6. Fig. 3: Why does the plot differ somewhat from the first submitted version? Please comment in your reply only and not in the manuscript.

7. Fig. 6: Please add "N = 12" in the plot to be consistent with the other plots.

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