



EGUsphere, referee comment RC1
<https://doi.org/10.5194/egusphere-2022-565-RC1>, 2022
© Author(s) 2022. This work is distributed under
the Creative Commons Attribution 4.0 License.

Comment on egusphere-2022-565

Anonymous Referee #1

Referee comment on "Development of an automated pump-efficiency measuring system for ozonesondes utilizing an airbag-type flowmeter" by Tatsumi Nakano and Takashi Morofuji, EGU sphere, <https://doi.org/10.5194/egusphere-2022-565-RC1>, 2022

General remarks:

This paper presents the development and validation of an automated pump efficiency measuring system for ozonesondes using the airbag method. An important topic in ozonesonde research to correct ozonesonde readings properly and currently also to get a better understanding of the recently observed total column ozone drop by ozonesondes (Stauffer et al., 2020). The paper describes the development and validation of the new system in all its technical and scientific aspects. After a short functional description of the ECC-sonde a technical overview of the setup of the measuring system is given, followed by a detailed description of the airbag methodology used to measure the pump efficiency at ambient air pressures between surface down to 3 hPa. The investigators also investigated and corrected for (i) back pressure effects; (ii) heat generation in the pump; (iii) differential pressure effects between airbag and ambient air in the vacuum desiccator; changes in the airbag capacity due to temperature changes. Since 2009 the automated system has been operationally used at three JMA sounding stations (Sapporo, Tateno, and Naha) for each flown ECC-ozonesonde. The results have been compared with pump efficiency measurements done by other investigators, e.g. Johnson et al. (2002; CMDL (bubble flow meter) and UWYO (bag method)) The authors have investigated the long term stability of the system to be better than a few percent per decade. In addition, a detailed statistical analysis of the time series of the pump efficiencies measured for the period 2009-2022 at the three JMA stations has been investigated and discussed in how far the fluctuations of the measured pump efficiencies observed between the different serial numbers of the sonde-pump can explain the total column ozone (TCO) drop of ECC sondes detected by Stauffer et al. (2020).

The paper is well structured and written, whereby it is recommended that a native English speaking person should improve some of the English in the paper. However, the content of the paper in all its aspects is very good and technically as well as scientifically. The presented techniques, methodologies, correction algorithms, measured time series of pump efficiencies, statistical results, and conclusions are new and are based on extensive and solid laboratory work and scientific analysis. All figures, tables and their layouts are appropriate to the results presented. The level of detail on the different corrections made

and the observed variability among the time series of the different stations has been treated in an appropriate and balanced way. The paper is an important contribution to the ozonesonde community to fill in the existing gap of having only a few pump efficiency measurements between 2009 and 2022. The paper is certainly a milestone in ozonesonde research. Therefore, the paper fits very well in the scope of the Atmosphere Measurement Techniques, and I rate the paper as very good and recommend publication after only minor revisions as listed below.

Some comments

L10 Replace: emulating by simulating

L14 Replace: accumulated by collected

L24 Replace: **the** detailed by **a** detailed

L25 Replace: flew up by flown

L27 Replace: chemical by electrochemical

L31 Replace: 80% by more than 90%

L62 Replace: research themes in the past by other investigators

L63/64 Replace silicone membrane by bubble

L66 Replace: the ECC- by ECC-

L124 Replace: to a small by of a small

Figure 8: Larger charactersize in legends

To be clear to the reader that after section 3-3 all further pump efficiencies reported in chapters 4 and 5 are always measured and determined with a 3 ml sensing solution in the cathode cell.

Figure 16: Larger charactersize of axis