Statement for modifying the data errors in Table 4 in the ACP article (egusphere-2024-1015)

In Table 4, we give the observed data ratios between different ozone sondes. In the program code for calculating the error we use the same algorithm as for calculating the ratios. During the proofreading, we discovered this calculation error and recalculated the data errors in Table 4 (marked in red in Table 4). Since the specific values in Table 4 were not listed during the analysis of the manuscript text (page 10, line 5-35), this modify only involves the data errors in Table 4 and does not involve the analysis section of the manuscript. Therefore, the modifications in Table 4 have no impact on the analysis and conclusions in the article.

The contents of Table 4 in the article are as follows:

profile is the same; rather, it indicates that the instruments respond in the same way.

With these assumptions, we can use the results of Fig. 2 to estimate the relative biases of each sonde type in relation to one another. The uncertainty in the comparisons will be the quadratic sum of the uncertainties in the two IAGOS–sonde comparisons. The results are shown in Table 4. This intercomparison of the different sonde types has an important advantage: it compares ozonesonde relative biases under operational conditions as it compares data that are actually in the databases (e.g. the WOUDC database). It also fills a gap as the last international WMO intercomparison involving all four sonde types was JOSIE 1996. These results are broadly consistent with those from JOSIE 1996 (Table 8 and Fig. 11 in Smit and Kley, 1998).

In fact, the types of ozonesondes have changed during long-term observations at some stations (e.g. Uccle and Payerne). De Backer et al. (1998) showed that with the use of an appropriate correction procedure that accounts for the loss of pump efficiency with decreasing pressure and temperature, it is possible to reduce the mean difference between O_3 profiles obtained with both types of sondes to below 3 %, which is statistically insignificant over nearly the entire operational altitude range (from the ground to 32 km altitude). Stübi et al. (2008) also found that the O_3 difference between the Brewer–Mast and ECC ozonesonde data shows good agreement between the two sonde types and that the profile of the O_3 difference is limited to ±5 % (±0.3 mPa) from the ground to 32 km altitude. The results for Brewer–Mast sondes, shown in Table 4, should also be applicable to older Payerne and Uccle records and are generally consistent with these findings and with those from older Canadian records (Tarasick et al., 2002, 2016).

The results in Table 4 will be quite valuable for addressing the problem of relative biases when merging ozonesonde data into global climatologies (e.g. McPeters et al., 2007; McPeters and Labow, 2012; Bodeker et al., 2013; Liu et al., 2013; Hassler et al., 2018).

4 Conclusions

The vertical distributions of tropospheric O_3 observed by ozonesondes and IAGOS sensors from 1995 to 2021 are compared at 23 pairs of sites between about 30° S and 55° N. Overall, ECC, Brewer–Mast, and carbon–iodine sondes agree reasonably well with aircraft observations, with average biases of 2.58, −0.28, and 0.67 ppb and correlation coefficients of 0.72, 0.82, and 0.66, respectively. The agreement between the aircraft and Indian-sonde observations is poor, with an average bias of 15.32 ppb and an R value of 0.44. Ozonesondes and aircraft observations exhibit smaller R values in the middle troposphere but a larger bias and RMSE in the upper troposphere. The bias and RMSE relative to the aircraft observations obtained at different altitudes for the ECC, carbon–iodine, and Brewer–Mast sondes are lower than those for the Indian sondes.

Table 4. Comparison of the sondes of each type to IAGOS. (average ± 2 times the standard error (SE)) Indian-sonde/ECC is (Indian-sonde/IAGOS)/(ECC/IAGOS), Brewer-mast/ECC is (Brewer-mast/IAGOS)/(ECC/IAGOS), Carbon-iodine/ECC is (Carbon-iodine /IAGOS)/(ECC/IAGOS)

Altitude(km)	Indian-sonde/ECC	Brewer-mast/ECC	Carbon-iodine/ECC	ECC/ IAGOS
0-1	1.59 ±0.54	0.83 ±0.15	1.10 ±0.21	0.98 ±0.16
1-2	1.31 ±0.40	0.81 ±0.13	1.00 ±0.16	1.07 ±0.15
2-3	1.20 ±0.35	0.89 ±0.12	0.93 ±0.13	1.08 ±0.13
3-4	1.14 ±0.33	0.88 ±0.11	0.90 ±0.12	1.10 ±0.13
4-5	1.13 ±0.35	0.89 ±0.11	0.91 ±0.13	1.10 ±0.13

5-6	1.18 ±0.39	0.91 ±0.12	0.92 ±0.13	1.08 ±0.14
6-7	1.20 ±0.41	0.91 ±0.14	0.92 ±0.15	1.09 ±0.16
7-8	1.22 ±0.45	0.92 ±0.18	0.90 ±0.18	1.11 ±0.19
8-9	1.29 ±0.54	0.95 ±0.25	0.85 ±0.22	1.12 ±0.26
9-10	1.35 ±0.62	0.97 ±0.33	0.79 ±0.27	1.11 ±0.33
10-11	1.41 ±0.69	0.98 ±0.37	0.70 ±0.26	1.12 ±0.36
11-12	1.39 ±0.67	0.97 ±0.31	0.67 ±0.23	1.12 ±0.32