

## ***Interactive comment on “Evaluation of SHADOZ sondes, HALOE and SAGE II ozone profiles at the tropics from SAOZ UV-Vis remote measurements onboard long duration balloons” by F. Borchi et al.***

### **Anonymous Referee #2**

Received and published: 4 October 2004

This paper compares the ozone profile amounts measured by a SAOZ instrument on board a long-duration balloon with observations of three operational ozone profiling systems and two ozone lidar instruments. Several large discrepancies are found between the SAOZ profiles and those from other systems, primarily in the troposphere. The source of these discrepancies is generally attributed to the less than optimal performance of the non-SAOZ instruments. This paper is a useful contribution and presents comparisons with ozonesonde and satellite profiles from an independent measurement system that is not normally available for comparison with these other instruments. There are numerous comparisons between various satellite systems and between ozonesonde and satellite profiles but comparisons with a balloon borne spectrometer are much less frequent. This paper has several shortcomings, however, that need to

be addressed before it is suitable for publication. The paper is difficult to read because of the organization of the paper and English language usage that in several instances makes the writing, and hence the point being made, unclear. There should not be a separate summary or discussion and conclusions subsection with each major section of the paper. These should be reserved for a single section at the end of the paper. Separate subsections repeat material that was discussed only a few sentences earlier and distracts from the flow of the paper. In section 2.2 the summary actually contains information (Figure 2 and information on the variability of the ozone profiles) that is not included earlier in Section 2.1. This material should be retained but the rest of 2.2 should be eliminated. Similarly with the other discussion and conclusion subsections, only material not already included should be retained and not as separate sections.

A significant problem with the paper is the methodology used in comparing various sets of profiles. There is a mixture of comparison and discussion of individual profiles and averaged profiles. Profiles in reasonable time and space correspondence with each other and those that are widely separated in time and space are compared. It is not clear when quantitative results are given whether they are based on the individual profile comparisons or averaged profiles. This problem first appears in the comparison between the Reunion lidar profiles and the SAOZ results. The statement is made that the “overall the agreement is excellent”. Is the agreement with the profiles measured on 23 February 2001 at Reunion and 24 February by SAOZ or is this statement based on the 1 and 4 February profiles as well? Figure 3 is way too small and not of sufficient resolution to determine anything about the altitude registration of either type of instrument. How was the altitude difference between the profiles determined? By visual inspection or some other means?

The problem of methodology in the comparisons comes to the forefront in the comparison between the ozonesondes from SHADOZ and SAOZ. Averaged profiles are compared and an altitude shift is deduced between these that it was concluded were larger than what might be expected from the response lag in the ozonesondes (90%

[Full Screen / Esc](#)[Print Version](#)[Interactive Discussion](#)[Discussion Paper](#)

response in 50 seconds). Since the balloon ascends at about 5-6 m/s the measured shift is generally consistent (expect perhaps at Fiji) with what might be expected corresponding to a 250-300 meter shift. Given the uncertainties in comparing profiles that are separated significantly in distance (Samoa is at 14S) and time it is not clear that a much slower response (80-140 seconds) than the published number can be inferred from these comparisons. The influence of high humidity at the surface and very cold tropopause temperatures on the ozonesonde performance should have no particular reason to impact the performance of the ozonesondes. It seems that it more likely that the measured altitude deviation between the systems is a confirmation of the published response of the ozonesondes within the uncertainties of the comparison. In the case of the ozone differences in the troposphere between the sondes at Samoa and Fiji and SAOZ the conclusion that the ozonesonde profiles likely reflect convectively influenced conditions seems warranted. The character of profiles plotted in figure 8 is strongly suggestive of such an influence. A useful reference on tropical Pacific tropospheric ozone behavior is Oltmans et al. (2001), Ozone in the Pacific tropical troposphere from ozonesonde observations, *J. Geophys. Res.*, 106, 32,503-32,525. Differences in ozonesonde technique have a much bigger impact in the stratosphere than in the troposphere and could not be a cause of the differences in the troposphere between SAOZ and the Pacific sondes. A useful reference here is Johnson et al. (2002), Electrochemical concentration cell (ECC) ozonesonde pump efficiency measurements and tests on the sensitivity to ozone of buffered and unbuffered ECC sensor cathode solutions, *J. Geophys. Res.*, 107(D19), 4393, doi:10.1029/2001JD000557.

In the comparisons with the satellite platforms the results in the stratosphere confirm the high quality of the satellite measurements. In the troposphere, where the differences are large, the conclusion that the satellite measurements have a number of deficiencies seems reasonable, although there were some significant differences between SAOZ and the ozonesondes as well. The attempt to determine the cause of the poor satellite performance in the troposphere seems quite speculative, however. If this analysis better clarifies the causes of the satellite problems in the troposphere beyond

[Full Screen / Esc](#)[Print Version](#)[Interactive Discussion](#)[Discussion Paper](#)

what has already been suggested these should be pointed out more specifically.

The phrase “long series of ozone profiles” used in the abstract and summary is not the appropriate terminology to describe the profiles obtained from the balloon-borne SAOZ measurements. Does this mean a large number of ozone profiles or ozone profiles obtained over a large distance? Editing by a native speaker of English would help this paper.

---

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 4945, 2004.

Full Screen / Esc

Print Version

Interactive Discussion

Discussion Paper