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Atmospheric Measurement Techniques Discussions

Interactive comment on "Ozone sonde cell current measurements and implications for observations of near-zero ozone concentrations in the tropical upper troposphere" *by* H. Vömel and K. Diaz

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A comment on "Ozone sonde cell current measurements and implications for observations of near-zero ozone concentrations in the tropical upper troposphere", by H. Vomel and K. Diaz

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The subject of this interesting paper is the back-ground signal of the ECC ozonesondes as measured in laboratory conditions.

Very similarily to the Vomel and al. experiment, we are preparing our sondes on a computer controlled bench with a similar TEI reference photometer and a high sensitivity digital meter for the current. Besides the operational duties, we have runned some response tests to better carcterise the back-ground current of our (ENSCI with 0.5% KI) operational ozonesondes.

The reason for publishing this comment is that our results do not aggree completely with the ones found by Vomel and al. For example, almost all our sondes do present a deficit of ozone compared to the TEI when we are doing the "5 μA / 10 min." current step; the deficit is around 1-3%. It is clear that we are not waiting hours as shown in fig. 3 but the sondes are not used in such long time interval in the operational conditions either. Therefore it is not clear that such long duration test represent the "normal" sondes behavior.

The figure 1 below shows the response of a sonde with increasing/decreasing ozone values cycle. The black line is the TEI and the red line is the sonde and in this test, the steps are 5 minutes long. The upper pannel is for the increasing part and the lower pannel is the decreasing part of the cycle. The total cycle corresponds to the usual time to reach the middle stratosphere in a real flight conditions.

In figure 2 below, the differences are reported similarily to figure 4 of Vomel and al. The squares correspond to the increasing ozone phase of the cycle while the circles are for the decreasing ozone phase. The three colors correspond to three different runs.

It is important to note that the sign of the difference is reversing along the cycle: the sonde response is lower than the TEI while the ozone is increased and the difference turns positive during the decreasing phase. As commented by the "Anonymous Referee #1", there is a clear memory effect in the response time of the sondes and the extrapolation of the ozone for the increasing, resp. the decreasing phases do not coincide. Therefore a more robust time response model would be required for the extrapolation. In our analysis of the time response of the sonde as expressed by equ. 4 of

Vomel et al., we have realised that the time constants tau and tau' are not the same for increasing, resp. decreasing ozone variations. Moreover, the statistics from our regular sondes preparation for these two parameters (decreasing ozone) show a distribution between 20-25 sec. for tau and 600 – 800 sec. for tau'. These are significantly different than the ones given by Vomel et al. which are maybe not as universal as the paper suggests.

These few elements show that the analysis of ozonesondes background presented in the Vomel et al. paper is to our view oversimplified. The parameters mentioned in the discussion paragraph could be different in the real conditions of an ozone sounding and some precautions should be given before actually suggesting a change the Standard Operating procedures for the ECC sondes.

Interactive comment on Atmos. Meas. Tech. Discuss., 2, 3153, 2009.

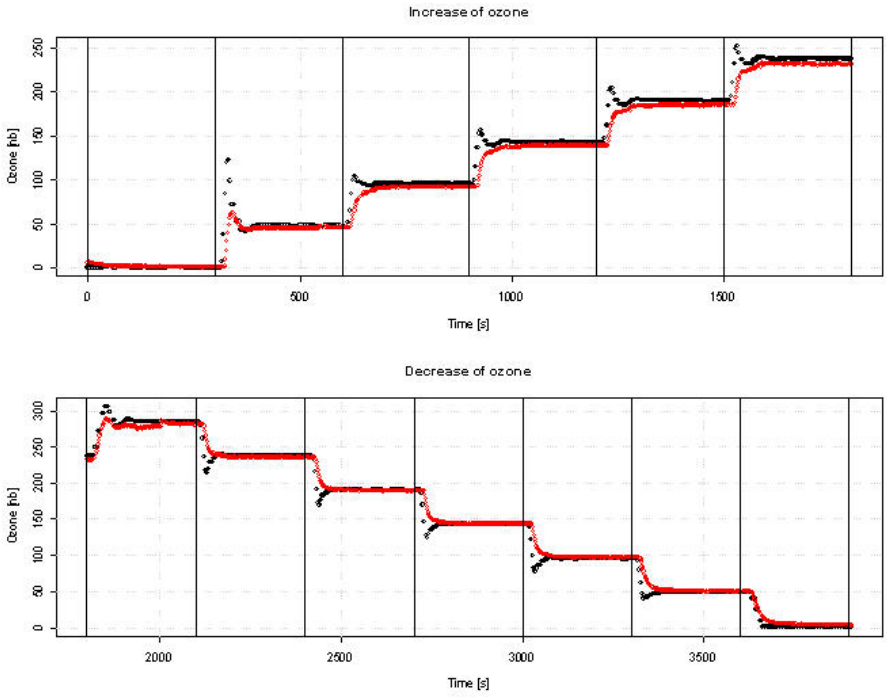

Fig. 1. Response of an ECC ozonesonde (ENSCI-0.5%).

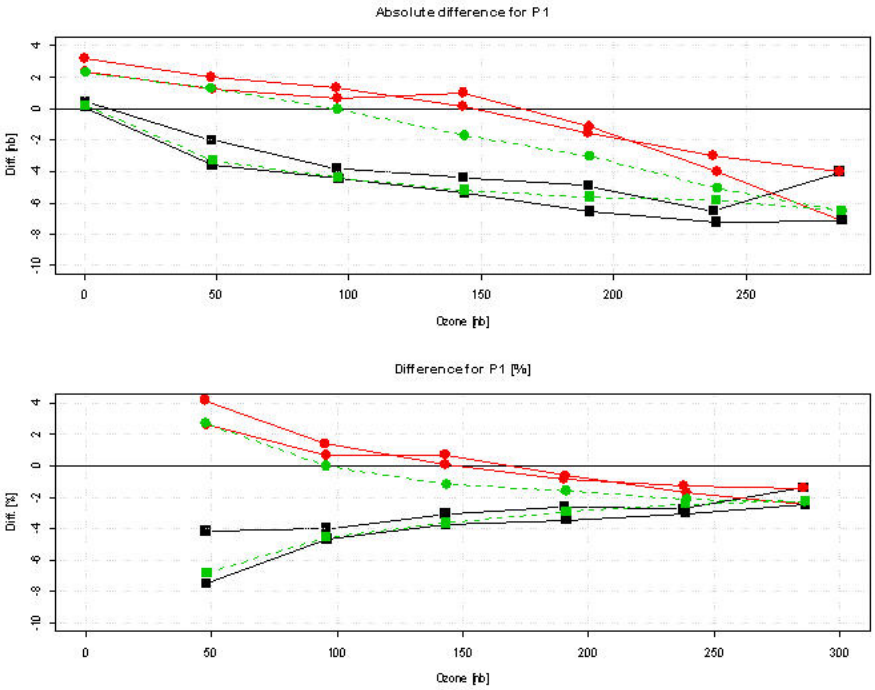

Fig. 2. Difference calculated from the data shown in figure 1. Upper pannel: direct differences (sonde – TEI); lower pannel, relative difference (sonde – TEI / TEI).