

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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We agree with most of the conclusions in the comment by Stübi et al. We had also noticed that the time constants for the increase in ozone might be different than those for the decrease in ozone. We do not claim that the time constants that we found are the best possible measurements of these constants, although we have tried to minimize all possible effects. In particular, we have taken great care that the switch from high ozone to zero ozone was not done by turning off the ozone generator, but rather by manually switching the port from which the inlet tube was sampling in order to min-

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imize tube flushing issues, which could increase these time constants. We recognize that more work has to be done to establish these time constants more rigorously than we have done and to correct for this delay in the sonde processing, something which is currently not done, but which would strongly improve the uncertainty estimate for ECC ozone sondes.

However, the focus of the paper is the background current, which is treated as time invariant and used as such in existing practices. The argument by Stübi et al. applies to the time dependency of the measured cell current in flight, but not to the determination of the time invariant background current as part of the lab work. For this measurement, it is important to measure for long enough periods at constant ozone levels to give any time-delay effects the opportunity to decay. We quantified the time constants to be able to show that reading the background current after 10 min is insufficient and that the durations of the plateaus we used was long enough to argue that delay effects had sufficiently decayed. By using plateaus of 90 min to 2 hours we waited roughly between three and four e-folding times, which we felt was a sufficient compromise with the increasing solution evaporation effects after longer measurement times.

We did not attempt a time lag correction and the time constants we derived do not impact the conclusions that we reached or the recommendation to change operational procedures. We need to point out, that our recommendation is not irreversible as long as results of the conventional background measurements are maintained in the metadata records for the sonde data, which will allow future work to make use of them and to improve on our recommendation. For tropical sites, which do not have access to compressed laboratory grade dry air and which may use filters of questionable quality, the implications of erroneously measured background currents are significant and a change in the conventional procedure to measure the background current might be warranted immediately.

The optimal sonde processing will have a time lag correction applied to the measured cell current in flight, and will use a constant cell background, which has been measured in the lab under the recognition that a time invariant sensor property is being

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measured, which will be used in the final sonde-data processing as a time invariant sensor property. We have done the first step to point out that this fact is commonly ignored and that this has important implications for observations in the upper tropical troposphere.

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