

Systematic biases owing to a response time issue of ozonesondes

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Ozonesonde is one of the unique methods providing us vertical profiles (from the surface up to about 30 km) of atmospheric ozone concentrations. Since the principle of electrochemical measurements is rather simple, ozonesonde observations have been widely conducted for long time. Now the data record of worldwide ozonesondes is one of the most important records for climate studies to see a long-term trend and variability. However, there is an inevitable issue, a response time of the measurement, because of its measurement principle using electrochemical solution cells. This issue has been recognized, and the response time is believed to be around 20 seconds from laboratory experiments.

Measurement uncertainty has been investigated in terms of the differences in manufactures and recipes of chemical solution, and several correction methods are proposed for homogenization of ozonesonde measurements. Under the Juelich Ozone Sonde Intercomparison Experiment (JOSIE), a series of chamber experiments had been conducted for the inter-comparison of ozonesondes (Smit et al., 2007). It was intended to clarify the differences in manufactures (SPC-6A and ENSCI-Z) and recipes of chemical solution. In the experiments they controlled ozone concentrations in addition to environmental temperature and pressure to simulate typical ozone profiles at mid-latitudes and tropical latitudes. In these profiles some additional settings were included such as those in which ozone amount is set zero instantly and is varying oscillatory.

In this presentation we will investigate the response time issue using data from the JOSIE experiment. First we will show general descriptions about the JOSIE experiment, and how to estimate response times. Then results about the response time will be presented for eight participants of JOSIE 2000. The response times are estimated ~10- 20 sec. for the experiments with stepwise and sinusoidal variations. These values are rather shorter than those acquired in pre-flight preparation; it is probably because we could not set it zero instantaneously. If we assume the response time ~20 sec., negative biases with maxima ~6% are expected in the equatorial lower stratosphere where the ozone amount increases very rapidly with increasing height.

Key words: ozonesonde, response time, JOSIE experiment

References

Smit, H. G. J., et al., 2007: *J. Geophys. Res.*, **112**, D19306, doi:10.1029/2006JD007308.