Ozone Trends in the Lower Stratosphere from Long-Term Lidar and Satellite Records

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While satellite and ground-based measurements indicate a significant recovery of ozone vertical distribution in the upper stratosphere at mid-latitudes (Steinbrecht et al., 2017), ozone increase has not yet been detected at global scale in the lower stratosphere where the bulk of ozone resides, about twenty years after the peak of ozone depleting substances in this region. A recent publication even indicates a decrease of ozone below 25 km over the 60°S-60°N latitude range (Ball et al., 2018).

Lidar ozone data have been shown to be very accurate in the range 15 – 25 km (e.g. Godin-Beekmann et al., 2003). Long-term lidar records are thus ideal data sets to cross-validate satellite ozone records in the lower stratosphere. In this study, we use lidar ozone records spanning more than 20 years from five lidar stations, e.g. Hohenpeissenberg (Germany), Haute-Provence (France), Table Mountain (USA), Mauna Loa (Hawaï, USA) and Lauder (New Zealand) in order to assess satellite records obtained in the vicinity of the stations and retrieve long-term ozone trends in the lower stratosphere. Particular attention is given to the choice of coordinates used for the computation of monthly means and to the selection of proxies in the trend model (Nair et al., 2013) for the representation of ozone interannual variability. The study includes an evaluation of the seasonality of the retrieved ozone trends at the various stations as well as a comparison with results from other trend models used in the SPARC/LOTUS initiative on ozone profile trends (http://www.sparc-climate.org/activities/ozone-trends/).

Key words: ozone trends, lower stratosphere, lidar, satellite observations

References

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