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# Long-term stability of stratospheric and mesospheric ozone profile data records from limb/occultation sounders

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It is generally assumed that the second phase of ozone recovery is currently ongoing, as a result of declining levels of ozone-depleting substances in the atmosphere. While the first phase of ozone recovery –the levelling off of the downward trend in ozone around 1997– is observationally well established, there is currently no community-wide consensus whether satellite- and ground-based measurements provide consistent, statistically significant evidence for an upward ozone trend in the past decade (WMO, 2014; Harris et al., 2015). Resolving this issue is hampered by at least two factors. First of all, the expected magnitude of the cumulative change in ozone levels is small (a few percent) when compared to the natural variability in the atmosphere. This can only be remedied by longer and/or denser time series. Secondly, there is a lack of accurate knowledge of the uncertainties in the observational data records, and especially their long-term stability. Our understanding of these uncertainties can be improved thanks to the simultaneous availability of many instruments –using complementary techniques from space or on the ground– in the past decade.

In recent work, we made a systematic assessment of the mutual consistency and geophysical structure of the long-term stability, bias and shorter-term variability of fourteen limb and occultation satellite sounders using ground-based network observations by ozonesondes and stratospheric ozone lidars as reference (Hubert et al., 2015). This analysis identified a statistically significant drift in several satellite (Level-2) data records relative to ground-based measurements, which very likely explains the differences observed between the trend analyses of various gridded (multi-)satellite (Level-3) data records. Here, we present three significant updates of our comprehensive assessment. The most important change is the addition of microwave radiometers as a third type of ground-based correlative instrument. This allows us to verify our earlier satellite drift estimates in the upper stratosphere obtained from comparisons to lidar, but also to extend the assessment well into the mesosphere and to investigate the impact of the diurnal cycle on the comparison results. Secondly, we update the assessment with the latest data release for several instruments (Aura MLS v4.2, MIPAS ML2PP7, OSIRIS v7 and ACE-FTS v3.5), and we compare the drift results to those for previous data versions. Finally, the Suomi-NPP OMPS Limb Profiler data are now also included and we will show results from an exploration of the comparison time series since early 2012.

References

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