Is Stratospheric Ozone Recovering as We Expect? Results of the SPARC LOTUS Analyses

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The WMO United Nations Environment Programme Assessment 2018 on the state of the ozone layer (a.k.a. Ozone Assessment) requires an accurate evaluation of both total ozone and ozone profile long-term trends. These trend results are of utmost importance in order to evaluate the success of the Montreal Protocol with regards to the recovery of the ozone layer. A previous activity sponsored by Stratosphere-Troposphere Processes and their Role in Climate (SPARC), International Ozone Commission (IO3C), Integrated Global Atmospheric Chemistry Observations - O_3 (IGACO-O3), and NDACC (SI^{2}N) successfully provided estimates of stratospheric ozone recovery trend in the period 1998 - 2012, from a variety of long-term records, however its results were different from those published in the WMO 2014 Ozone Assessment report. In the most recent years, new merged satellite data sets and several homogenized ozonesonde data series have been produced. Improved datasets feature correction of the drifts in satellite records (i.e. Origins, Spectral Interpretation, Resource Identification, and Security [OSIRIS], Global OZone Chemistry And Related trace gas Data records for the Stratosphere [GOZCARDS], Michelson Interferometer for Passive Atmospheric Sounding [MIPAS]), reduction in the sampling biases, addition of four extra years in established satellite records (i.e. Aura Microwave Limb Sounder [MLS], Aura Ozone Monitoring Instrument [OMI], etc.), addition of new satellites (i.e. Joint Polar Satellite System Ozone Mapping Profiler Suite [JPSS OMPS]), and re-evaluation and re-processing of ground-based records. Initiation of the SPARC Long-term Ozone Trends and Uncertainties in the Stratosphere (LOTUS) activity in 2016 provided an opportunity for assessment of new and updated data records, comparisons of multiple regression models, assessment of stability in the combined satellite and ground-based records, evaluation of representativeness of the ground-based records in the broad-band trends, and determination of statistical methods for combining trends from different observational records. The LOTUS assessment of the stratospheric ozone recovery rates delivers high confidence in the results and creates a platform for understanding of limitations in determining significance of ozone recovery. This presentation will provide overview of the LOTUS results and discuss the way forward.

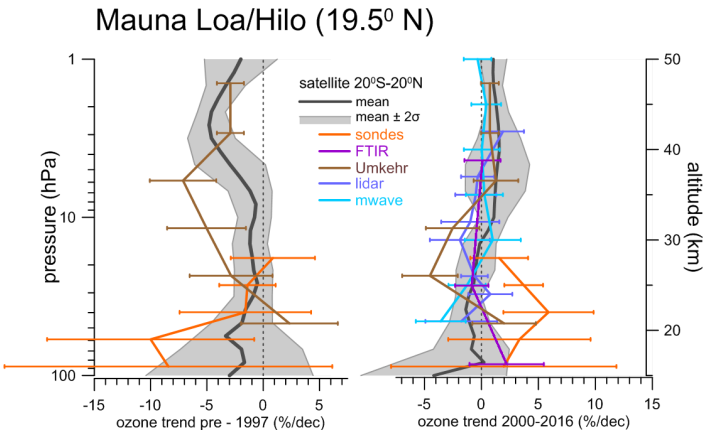

Figure 1. Ozone trends for the pre-1997 and post-2000 period from the satellites, averaged over 20°S-20°N, and ground-based stations, which includes ESRL/GMD Dobson Umkehr record from the Mauna Loa Atmospheric Baseline Observatory, and ozone-sondes records from multiple NOAA/Southern Hemisphere Additional OZonesonde (SHADOZ) stations.