Long-term ozone variability and trends from reanalyses

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Stratospheric ozone has a profound impact on radiation and chemistry over various spatial and temporal scales. The evolution of stratospheric ozone over the 21st century, however, is not well understood, especially in the lower stratosphere. Highly vertically resolved ozone data from satellite-borne limb sounders have proved to be invaluable for studying ozone in the middle and upper stratosphere but it was not until recently that these measurements were successfully incorporated in atmospheric reanalyses. Validation and comparison studies have demonstrated that the addition of observations from the Microwave Limb Sounder (MLS) on EOS Aura greatly improved the quality of ozone fields in MERRA-2 making these assimilated data sets more useful for scientific research.

In this presentation we demonstrate that multidecadal lower-stratospheric ozone variability and trends can be derived from NASA's MERRA-2 reanalysis ozone. In particular, the reanalysis ozone bias-corrected using a chemistry model simulation as a transfer function agrees very well with recently reprocessed long ozonesonde records. Ozone trends in the lower stratosphere will be discussed in the context of recent findings (Ball et al., 2018) and interpreted in connection with long-term circulation changes in the lower stratosphere. Next, we show that the use of ozone data retrieved from the next generation OMPS instruments, including the OMPS Limb Profiler, can successfully extend the reanalyses into the future allowing comprehensive monitoring of global ozone and interpretation of its evolution during the critical period of expected ozone recovery and climate change from increasing concentration of greenhouse gases.

Key words: ozone, reanalyses, stratosphere, trends

References

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