AGU Fall Meeting Paper Number A33J-3332
Estimating Uncertainty in Long Term Total Ozone Records from Multiple Sources

Stacey M. Frith, Space Systems and Applications, Inc., Lanham, MD, USA; Richard S. Stolarski, Johns Hopkins University, Baltimore, MD, USA; Natalya Kramarova, Space Systems and Applications, Inc., Lanham, MD, USA; Richard D. McPeters, NASA Goddard SFC, Greenbelt, MD, USA

1. Introduction
Long-term ozone records required for time series analysis must be constructed from multiple instrument records of varying type and quality. Also needed are realistic estimates of the uncertainty of the long-term record, including contributions from the individual instrument uncertainty and from the merging process. In this work we estimate uncertainties in the SBUV V6.6 Merged Total Ozone Data Set (updated from Frith et al. [2014] through June 2016). With only a single SBUV instrument still in operation, we investigate extending the record with data from Aura/OMI and S-NPP/OMPS nadir-view instruments, and the ramifications on the error analysis. Updated ozone trend results from SBUV V6.6 MODJ are shown.

2. Data intercomparisons demonstrate relative stability of instruments

- Continuous coverage of SBUV instruments since late 1978. N19 SBUV/2, Aura/OMI and S-NPP OMPS continue coverage into future.
- SBUV measurements are inter-calibrated at the radiance level. Long overlap of OMI and SBUV will help maintain consistent calibration of merged record into future.

3. Error estimates not sensitive to additional year of data

Following the procedure outlined in Frith et al. [2014] we update the 6.6 MOD error estimates using new measurements from N15 and N19 SBUV. We use Monte Carlo simulations to represent uncertainties in the merged record and test the sensitivity of derived trends to these potential variations. SBUV measurements are inter-calibrated at the radiance level to either N15 SBUV (1994-95) or N17 SBUV (2005-06), whose absolute calibrations have been established independently (Dolal et al., 2012). We mimic this calibration process, but with random offsets and drifts added to each data set to simulate individual instrument uncertainties. We then merge each simulated set of instrument records.

4. Including OMI improves error slightly as SBUV instruments end

We do not include OMI or OMPS data in the MOD record at this time as new versions of both are anticipated in the next year.

5. Trends from extended MOD record mixed on indications of recovery

- Error bars are root mean square of uncertainty from residual variability and MOD uncertainty.
- As found in Frith et al. [2014] EESC fits over the full period (converted to N/Dec for Jan 2000 – June 2014) are statistically significant but linear fits over the time period are not.
- EESC fits lock in an assumed loss to recovery ratio in the regression. Ideally a linear fit would verify the assumed EESC recovery rate.

Conclusions
- Aura OMI and S-NPP OMPS NM are quality data sets that can be used to extend the MOD record. New releases of OMI and OMPS are expected in 2015 and will likely be incorporated at that time.
- Including calibration and instrument quality information gives a more realistic model of noise in a merged data set which can then be tested for potential interaction with common regression process.
- Despite a statistically significant fit to EESC, a longer time series is required to detect an ozone increase using a linear trend fit starting in 2000 and thus verify the assumed EESC recovery rate.

References
https://ntrs.nasa.gov/search.jsp?R=20150002121 2018-09-11T08:25:57+00:00Z