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 SUAV VI.6-Merged Total Ozone Data Set (updated from Frith et al. [2014] through June 2014). With only a single SUAV 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 SUAV VI.6 MOD are shown.

2. Data intercomparisons demonstrate relative stability of instruments

- Continuous coverage of SUAV instruments since late 1978. N19 SUAV/2, Aura/OMI and S-NPP OMPS continue coverage into future.
- SUAV measurements are inter-calibrated at the radiance level. Long overlap of OMI and SUAV 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 VI.6 MOD error estimates using new measurements from N16 and N19 SUAV. We use Monte Carlo simulations to represent uncertainties in the merged record and test the sensitivity of derived trends to these potential variations. SUAV measurements are inter-calibrated at the radiance level to either N11 SUAV (1994-95) or N17 SUAV (2005-08), whose absolute calibrations have been established independently (Dolanard 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 SUAV 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.

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