A Comparison of Ground-Based Ozone Measurements to TOMS Version 8 Data Over the Continental United States

R.D. Evans[1], G.L. Carbaugh[1], S.J. Oltmans[1], B. Walsh[1], D.M. Quincy[1,2], M. O'Neill[1,2], and M. Clark[1,2]

[1]NOAA Climate Monitoring and Diagnostics Laboratory, 325 Broadway, Boulder, CO 80305;
303-497-6679; Fax: 303-497-6290; E-mail: Robert.D.Evans@noaa.gov
[2]Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder 80309

Total column ozone is measured over the continental United States by ground-based and satellite-borne instruments. We investigate the data records of six of the ground-based instruments (Table 1) and one of the satellite instruments. Dobson ozone spectrophotometers are operated regularly at four weather service stations, CMDL headquarters in Boulder, Colorado, and at NASA's Wallops Island Flight Center in Virginia. The satellite instrument is the Earth Probe Total Ozone Mapping Spectrometer (EPTOMS), and the data set was processed with the Version 8 algorithm. This instrument will be referred to as EPTOMS8. The data record for this instrument starts in July 1996 and continues to the present (Table 1). Our interest in the study is to detect problems in the ground-based data set using the EPTOMS8 data as an independent baseline. A combined data set was formed using only days with matching EPTOMS8 and ground-based direct sun observations. We discovered that, in general, the ground-based data follows the EPTOMS8 with station specific offsets. We investigated the deviations from the average with respect to the reported satellite parameters (scan angle, distance from station, etc.) without finding any relationship. There are short-term (1 to 4 day) larger deviations at several stations that could relate to incorrect observations at those sites (Figure 1).

Table 1: Ground Stations

Station	Code	Lat	Long	Offset	StDev
Boulder	BDR	40.0	105.2	-2.0%	3.0%
Bismarck	BIS	46.8	100.8	-0.3%	2.8%
Caribou	CAR	46.9	68.0	-1.2%	3.5%
Wallops	WAI	37.9	75.5	1.3%	3.0%
Hanford	HNX	36.3	119.6	-0.3%	3.3%
Nashville	BNA	36.2	86.5	-0.1%	4.0%
Nashville Pre-2001				1.4%	2.8%
Nashville Post-2001				-2.8%	2.8%

The operators of the EPTOMS8 acknowledge problems with equipment and calibration, and certain periods of the data reflect these problems. A drift in the EPTOMS8 calibration in the last 6 months of 2004 is evident against all the ground-based stations.

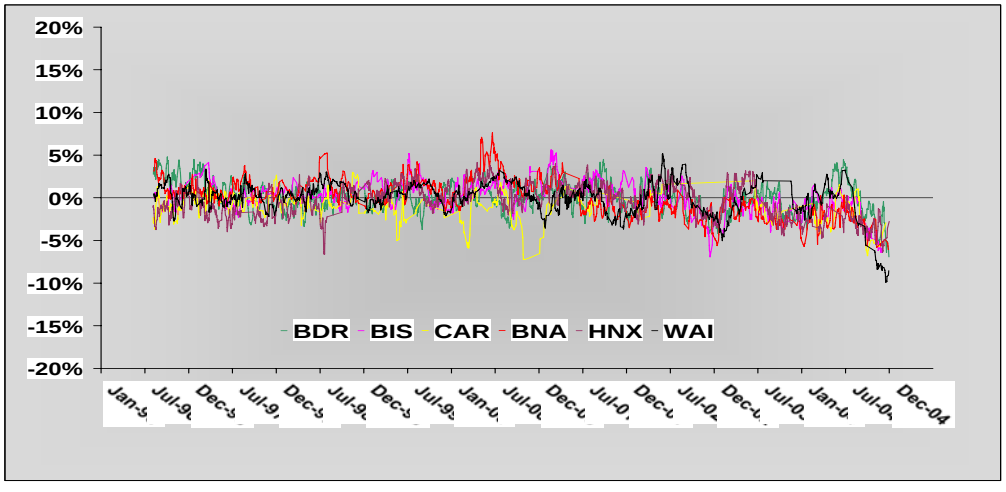

Figure 1. Seven-day running mean of six ground stations versus EPTOMS8. Differences are calculated by (EPTOMS8-Ground)/Ground) × 100%) - station offset.