NOAA's Antarctic Ultraviolet (UV) Monitoring Program: It's More Than Just UV

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Since the discovery of the Antarctic ozone hole the National Science Foundation has supported a polar (Arctic and Antarctic) UV monitoring program. This monitoring effort has produced a continuous dataset for more than 23 years at several polar sites, which include the three Antarctic stations, the South Pole, McMurdo and Palmer. The Global Radiation group (G-RAD) of NOAA ESRL’s Global Monitoring Division took over the operations of the three Antarctic stations in May 2010. In the short period that G-RAD has operated the network we are finding more utility in the long-term dataset than what was originally intended. The measurement of the biologically effective UV-B is important for studying how changes in UV-B irradiance affect humans and the biosphere. However, the spectral range of the SUV-100 beginning at approximately 300 nm and extending out to 600 nm makes this a very unique dataset in that it consists of both spectral UV and visible irradiances. Research that requires irradiances in both the UV and visible spectral regions can be pursued with this high quality dataset. One such research avenue we are pursuing is the validation of work by Haigh et. al. who recently, in a letter published in Nature noted unusual solar activity in the declining phase of solar cycle number 23 from 2004 to 2007. When analyzing the Spectral Irradiance Monitor (SIM) data on the SORCE satellite, they found a 4-6 times larger decline in the UV than what was expected from model data produced by Lean. This is offset by a small increase in visible solar output yielding comparable total solar output as measured by the SIM and the Lean model, but with considerably different spectral signature. According to Haigh this has ramifications in computing radiative forcing. We believe that this level of change in the spectral solar output can be seen in the long-term Antarctic dataset. We specifically chose the South Pole for an initial study on the data due to the extremely clean air at this site, thereby greatly reducing any complications due to aerosols in the comparison. The precision of the Antarctic spectroradiometers is very good, so the ratio of the change stated by Haigh in UV to the change in the visible over this time period should reveal itself in these ground-based measurements. Here we present our initial results of this comparison. Additionally, we show examples of the important network data such as spectral UV irradiance and some of the derivative products such as total column ozone, UV index, DNA response, to name a few. The NOAA Antarctic monitoring program website was recently launched and its URL is ersrl.noaa.gov/gmd/grad/antuv. All metadata, data, relevant publications and pertinent documents can be obtained through this web portal.

Year	340 nm irradiance μW/cm^2*nm	500 nm irradiance μW/cm^2*nm	Ratio 340/500
2004	32.07869	64.73205	0.496
2007	32.61054	65.68092	0.496
Ratio 2004/2007	0.984	0.986	0.998

Table 1. The South Pole SUV-100 data are presented in table 1 and show an approximate 1.6% increase in the UV at 340 nm from 2004 to 2007 and a similar 1.4% increase in the visible at 500 nm. The fact that they are both increasing does not agree with the spectral signature discussed by Haigh et.al. when comparing the SIM data from 2004 to 2007. These are preliminary results and more work needs to be done to better understand how the SIM data compare to the SUV-100 ground-based measurements before any conclusions can be drawn. This does, however, show the utility of the long-term Antarctic data set.