

Measurement of Internal Stray Light within Dobson Ozone Spectrophotometers

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Internal stray light within the Dobson ozone spectrophotometer limits the ability of the instrument to make accurate measurements at high total ozone amounts and high solar zenith angles (SZA). The effect is well known, and can be easily identified when observations are made on the direct solar beam over a half day at a northern high latitude site, especially in springtime. The effect is demonstrated by this: total ozone values calculated from the series of observations will show a sharp decrease after the SZA increases beyond a certain point. The actual SZA limit depends both on the quality of the individual instrument optics, the wavelength pairs used and the actual total ozone amount. The latter dependency on total ozone has made this a difficult problem to solve. Additionally, a recent analysis of comparative Dobson observations of the Umkehr effect (a SZA-dependent series of measurements on the clear zenith that are used to produce an ozone vertical profile) has shown that internal stray light produces incompatible results for compared instruments. We present a method of making the measurement of this internal stray light, using a small modification of the instrument, and an external filter. A change in the method of making the observations of the Umkehr effect and in the reduction of the data will likely be required to achieve the full benefit of this knowledge. The technique is also applicable to direct sun observations at high latitudes and high ozone.

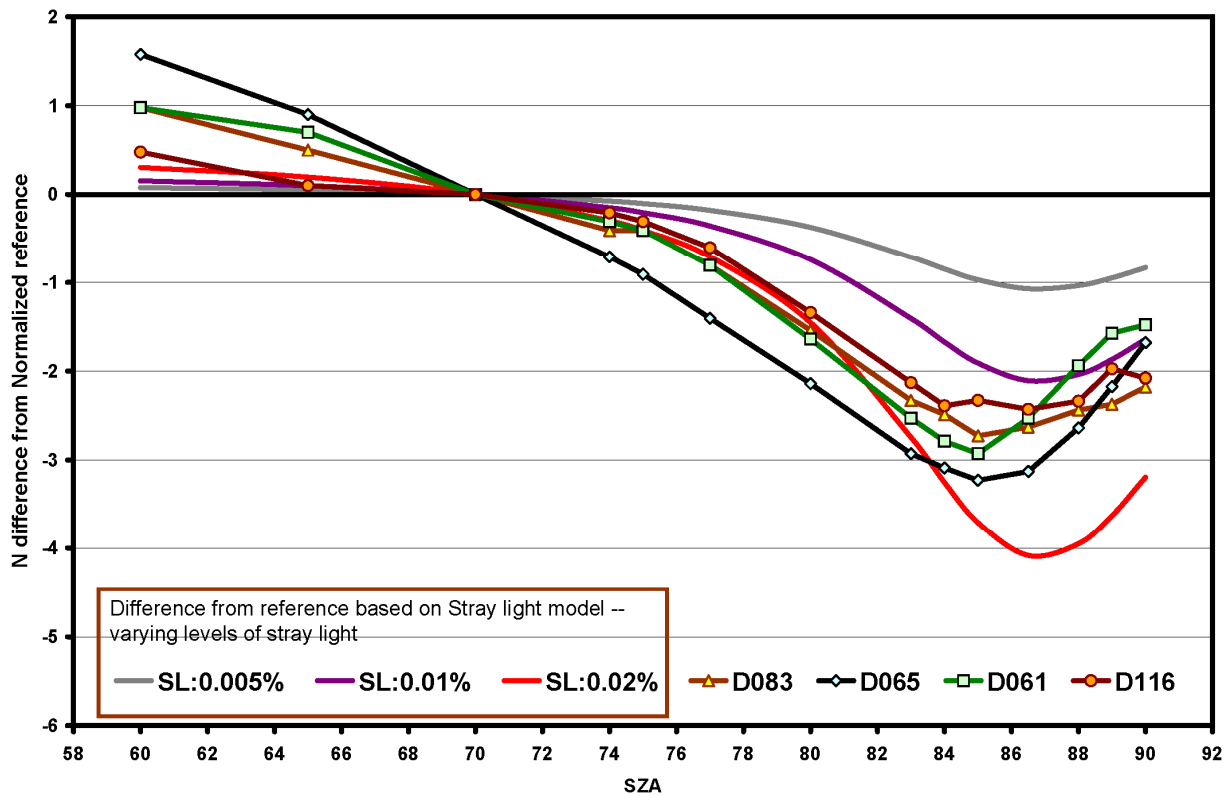


Figure 1. The difference curves (reference value minus observed value) from measurements made 27 Sept 2007, presented with the difference curves predicted from modeled straylight within the Dobson instrument.