AT 652 Fall 2013
Atmospheric Remote Sensing
Project 1: Turbidity at Mauna Loa
Due September 20, 2013

The purpose of this project is to carry out analysis of solar extinction data in order to derive information about atmospheric aerosol.

J.D. Griggs. Jan 10, 1985
http://hvo.wr.usgs.gov/maunaloa/

Procedure and Tasks:

1. Plot the 1984 and 1987 Mauna Loa data on separate Langley diagrams and determine the slopes and y-intercepts of the curves. What do the slopes and y-intercepts represent?
2. Using the subroutine pmrayl.f, determine the aerosol optical depth at three specified wavelengths (380, 500, and 778 nm).
3. Calculate the wavelength exponent (alpha) for the two periods and discuss any inferences you make about the relative size of the aerosol measured, bearing in mind the time of the El Chichón volcanic eruption (look up details regarding eruption on internet). You will note that this value of alpha depends on which particular pair of wavelengths you choose. Give a physical account for why this is the case.

Files you will need: (available at http://reef.atmos.colostate.edu/~odell/at652/turbidity_files/)

- driver_pmrayl.f (or driver.pro for IDL)
- pmrayl.f (or pmrayl.pro for IDL)
- mlo78jan.84
- mlo78jan.87

The FORTRAN subroutine pmrayl.f (or IDL subroutine pmrayl.pro) calculates the Rayleigh and Ozone optical depths for the three wavelengths specified above. In order to compute the Rayleigh optical depth, a surface pressure must be specified. Assume the climatological value of surface pressure for this station (already provided in the subroutines).

The latter files (mlo78jan.84 and mlo78jan.87) contain direct beam solar radiation measurements at 380, 500 and 778 nm for January 1984 and January 1987, respectively. The location of these measurements is Mauna Loa, Lat/Lon = (19.533N, 155.578W) at an elevation of 3400 meters. A sample of the first 4 lines of data from file mlo78jan.84 is shown below.

Year	Day	Time	V1	V2	V3	Air Mass
84	7	17.9333	2.988	5.190	6.396	4.9435
84	7	17.9500	3.071	5.254	6.423	4.8611
84	7	17.9667	3.157	5.315	6.453	4.7808
84	7	17.9833	3.235	5.361	6.465	4.7037