Assignment 8 FYS4630/FYS9630

Friday November 6, 2015

Download the uvspec program from the webpage.

The file 'solar.inp' contains top-of-the-atmosphere solar flux, absorption cross sections for ozone and molecular oxygen, Do not edit this file.

The file 'subarcticwinterN.atm': Here the user can set the value of nstr, asymmetry factor and delta-M. The file also contains a model atmospheric profile (pressure, temperature and ozone).

1) Compute the downward total spectral flux (direct + diffuse) 290 -800 nm at the bottom of the atmosphere for surface albedo A_g= 0.05 and 0.80. Assume clear-sky conditions, solar zenith angle 40° and total ozone column amount 300 DU. Plot the ratio of the two spectra, i.e. $F^-(A_g = 0.80)/F^-(A_g=0.05)$. Explain why the ratio is > 1 and why a maximum is found around 320 nm. Hint: Wavelength dependent Rayleigh scattering cross section and wavelength dependent ozone absorption cross section.

2) Compute the spectral downward diffuse flux for 290 – 800 nm at the bottom of the atmosphere for surface albedo 0.05 for a) total ozone column amount 300 DU and b) for an atmosphere without any ozone (0 DU). Plot both spectra and comment the result. Assume clear-sky and that the solar zenth angle is 40°.

3) Compute the downward diffuse flux at the ground for 305 nm. The surface albedo is 0.05, the solar zenith angle is 40°, the sky is clear and the total ozone column amount is 300 DU. Repeat the calculation but now with a slightly different ozone profile: Move 10 DU from the layer between 14 and 15 km to the bottom layer (0-1 km), so that the total ozone column amount is unchanged. How does this redistribution of ozone affect the calculated downward diffuse flux? What is the explanation for the difference in downward diffuse flux?