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UV Spectral radiance distribution under sky overcast with cirrus clouds

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The spectral sky radiance distribution has been investigated for a sky overcast by cirrus cloud. Radiance measurements at 310, 350 and 380 nm were made at the nodes of a 10º azimuth and zenith grid using a Bentham DTM 300 spectroradiometer and a sun tracker from a rooftop in Manchester, England (53.4^{o}N, 2.2^{o}W). The data were normalised and the normalised distribution compared to the radiance distribution from a clear sky radiative transfer model. The model was a hybrid of Grant's model (Grant et al., 1997) for the circumsolar area (scattering angles $< 30^{o}$) and the UVSPEC model (www.Libradtran.org) for the rest of the sky. The normalised model distribution was calculated for points corresponding to the measurement grid. Thus the radiance distribution patterns were compared, but not the absolute amounts since no information about the cloud depth or microphysics were available.

The ratios of the radiance distributions from clear sky model and measurements at three wavelengths showed that the effect of cirrus clouds did not significantly change the radiance distribution, and also had negligible scattering angle and wavelength dependence over a wide range of scattering angles. In other words, in order to solve the radiative transfer problem a 1-Dimentional model including cirrus cloud with similar optical characteristics can be used for overcast cirrus clouds at UV wavelengths, and the plane parallel assumption is probably sufficient, requiring only the optical depth to be specified.