

From talk with Kyaw Tha (12/6/2006): (Becker, 2001) equation not appropriate. Also, need to diss-aggregate hourly beam radiance  $B_h$  from global hourly radiance  $G_h$  as measured by the pyranometer (LI-200) for use in Equation 3.4. A coarse estimate of  $B_h$  from  $G_h$  measurements, based on the assumption that hourly diffuse radiance  $D_h$  is approximately 10 to 20 percent that of  $B_h$  can be found with:

$$B_{hn} \approx \frac{G_h}{f + \sin(\alpha)} \quad (3.1)$$

where  $f$  is in the range of [0.1 - 0.2],  $\alpha$  is the solar elevation (angle) as computed by `r.sun mode 1`. The disaggregation step must be include the solar elevation, as the diffuse ... (get details from kyaw tha).

From (Cucumo et al., 2000) :

Estimation of the Rayleigh extinction coefficient:

$$\delta_R = \frac{1}{6.6296 + 1.7513m - 0.102m^2 + 0.0065m^3 - 0.00013m^4} \quad (3.2)$$

where  $m$  is the estimated air mass:

$$m = \frac{1}{\sin(\alpha) + 0.15(\alpha + 3.885)^{-1.253}} e^{-0.0001184 \cdot A} \quad (3.3)$$

where  $\alpha$  is the solar elevation (angle), and  $A$  is the elevation in meters.

Calculation of the Linke turbidity value

$$T_{linke} = \frac{-\ln(B_{hn}) + \ln(I_{ext})}{\delta_R \cdot m} \quad (3.4)$$

An 11-year average range in solar radiation data from the NPS Air Quality station provides a range in expected daily, total insolation.