equation (3.1), and the diffuse attenuation coefficient averaged from the surface to z_1 is calculated as

$$K_d\left(\bar{z}_{01},\lambda,t\right)=\frac{1}{z_1}\ln\left[\frac{E_d\left(0^-,\lambda,t\right)}{E_d\left(z_1,\lambda,t\right)}\right], \tag{3.3}$$

where $\bar{z}_{01}=\frac{z_1}{2}$.

c. $K_d\left(\bar{z}_{ij},\lambda,t\right)$ from $E_d\left(z_i,\lambda,t\right)$ and $E_d\left(z_j,\lambda,t\right)$,: Given two underwater downwelled irradiance sensors at depths $z_j > z_i$, the diffuse attenuation coefficient averaged over that depth interval is given by

$$K_d\left(\bar{z}_{ij},\lambda,t\right)=\frac{1}{z_j-z_i}\ln\left[\frac{E_d\left(z_i,\lambda,t\right)}{E_d\left(z_j,\lambda,t\right)}\right], \tag{3.4}$$

where $\bar{z}_{ij}=\frac{z_i+z_j}{2}$.

d. $K_L\left(\bar{z}_{ij},\lambda,t\right)$ from $L_u\left(z_i,\lambda,t\right)$ and $L_u\left(z_j,\lambda,t\right)$,: Given two underwater upwelled radiance sensors at depths $z_j > z_i$, the diffuse attenuation coefficient averaged over that depth interval is given by

$$K_L\left(\bar{z}_{ij},\lambda,t\right)=\frac{1}{z_j-z_i}\ln\left[\frac{L_u\left(z_i,\lambda,t\right)}{L_u\left(z_j,\lambda,t\right)}\right], \tag{3.5}$$

where $\bar{z}_{ij}=\frac{z_i+z_j}{2}$.

In principle, the uncertainties of the diffuse attenuation coefficients determined using (3.4) and (3.5) should be better than that from (3.3), and the uncertainty associated with any of those 3 methods should be better than the estimates of $\bar{K}\left(\lambda,t\right)$ modeled using ratios of upwelled radiance measured just below the sea surface. If the measurement combination from a particular buoy is sufficient, it is recommended that diffuse attenuation coefficients be calculated for comparison and quality control purposes.

2. ***Water-Leaving Radiance*** $L_W\left(\lambda,t\right)$ is determined by extrapolating upwelled radiance measured at depth *z* to the surface as

$$L_u\left(0^-,\lambda,t\right)=L_u\left(z,\lambda,t\right)e^{\bar{K}_L\left(z,\lambda,t\right)z}, \tag{3.6}$$

where $\bar{K}_L\left(z_i,\lambda\right)\equiv\frac{1}{z_i}\int_0^{z_i}K_L\left(z,\lambda\right)dz$. Upwelled radiance is then propagated upward through the interface as $L_W\left(\lambda,\theta,\phi\right)=\frac{1-\rho\left(\theta',\theta;W\right)}{n^2}L_W\left(0^-,\lambda,\theta',\phi\right)$, for general viewing angles $\theta'>0$ [see Vol. I, Chapter 2, (Sect. 2.5) and Vol. III, Chapter 4,][6]. If only nadir-viewing geometry is considered, then the surface reflectance term becomes independent of wind speed *W*, and the upward transmittance term is constant at $\frac{1-\rho\left(0,0;W\right)}{n^2}=0.543$ (Austin 1974), and water-leaving radiance is calculated as

[6] Note that $\rho\left(\theta',\theta;W\right)$ is reflectance for a wind-roughened sea surface, and not the Fresnel reflectance.