calculated from ratios of either water-leaving radiance at different wavelengths, or more directly from ratios of near-surface measurements of upwelled spectral radiance (*e.g.* Sutton *et al*. 2001). Algorithms for calculating these parameters are cited in item 1a) above, as part of the discussion of methods to determine diffuse attenuation coefficient.

Quality Control:

1. Inspect the time-series of raw data in each radiometric channel for bad data points (*e.g.* obvious dropouts), instrument failure, power failure, and symptoms of biofouling.

2. Calculate time series of normalized spectra $\hat{E}_{\mathrm{d}}\left(z_i,\lambda,t\right)=\dfrac{E_{\mathrm{d}}\left(z_i,\lambda,t\right)}{E_{\mathrm{d}}\left(z_i,\lambda_{\mathrm{REF}},t\right)}$, $\hat{L}_{\mathrm{u}}\left(z_i,\lambda,t\right)=\dfrac{L_{\mathrm{u}}\left(z_i,\lambda,t\right)}{L_{\mathrm{u}}\left(z_i,\lambda_{\mathrm{REF}},t\right)}$ and $\hat{L}_{\mathrm{W}}\left(\lambda,t\right)=\dfrac{L_{\mathrm{W}}\left(\lambda,t\right)}{L_{\mathrm{W}}\left(\lambda_{\mathrm{REF}},t\right)}$. Test whether

   a. The shapes of these spectra should be consistent with those of normalized spectra from previous deployments in the site, and from earlier in the current deployment.

   b. The shapes of $\hat{L}_{\mathrm{W}}\left(\lambda,t\right)$ spectra should be consistent with similar spectra of wavelength ratios in time-series of water-leaving radiances determined from SeaWiFS, MODIS, and other ocean color satellites.

   c. Following Abbott and Letelier (1998), set $\lambda_{\mathrm{ref}}=555$ nm and use $\hat{L}_{\mathrm{u}}\left(z,683,t\right)$ and $\hat{E}_{\mathrm{d}}\left(z,683,t\right)$ to test for biofouling. In theory, if chlorophyll bearing organisms aggregate on or near the radiometer's window (or collector), the transmittance of the window (or collector) at 555 nm would be severely decreased while chlorophyll fluorescence on or near the surface would continue to provide a significant signal. Abbott and Letelier (1998) suggest that biofouling is indicated when either ratio exceeds 0.1, a value appropriate for clear oligotrophic water masses. In very productive coastal water masses, a threshold of 0.5 may be more appropriate. A regional threshold may be established by comparing the $\hat{L}_{\mathrm{u}}\left(z,683,t\right)$ and $\hat{E}_{\mathrm{d}}\left(z,683,t\right)$ (555 nm reference) ratio history during each deployment to the extent of biofouling observed when the sensor is recovered.

3. Compare absolute values of water-leaving radiances derived from the buoy measurements with those determined from SeaWiFS and other satellite ocean color sensors. These comparisons are best done in a time-series mode to detect outliers, and divergences indicating the onset and growth of biofouling organisms on the optical surface. Caution must be used in this method if the *in situ* data are collected in regions that are characterized by Case 2 water types with high concentrations of colored dissolved and particulate organic matter, relative to to phytoplankton pigment concentration. Moreover, the atmospheric correction procedure used by SeaWiFS, and other ocean color sensors, may underestimate the normalized water leaving radiance estimates in Case 2 waters.

4. Examine diffuse attenuation coefficients calculated from the data

   a. Check whether $K_{\mathrm{d}}\left(z,\lambda\right)\geq a_{\mathrm{w}}\left(\lambda\right)$, where $a_{\mathrm{w}}\left(\lambda\right)$ is the spectral volume absorption coefficient of pure water [Vol. I, Chapter 2 (Sect. 2.5) and references cited therein]. If $0<\left[a_{\mathrm{w}}\left(\lambda\right)-K\left(\lambda\right)\right]\leq 0.005$ m^{-1}, flag the data as suspect, but if $\left[a_{\mathrm{w}}\left(\lambda\right)-K\left(\lambda\right)\right]>0.005$ m^{-1} the diffuse attenuation coefficients are clearly bad data. If such conditions persist, it is likely that one of the radiometric channels used to determine the diffuse attenuation coefficient has either failed, or has experienced significant biofouling. In MBARI's experience in the equatorial Pacific, less than 5% of the calculated data fail this test, and this percentage should be less in mesotrophic or eutrophic waters. Measurements not meeting this criterion usually occur during extremely cloudy or overcast days, and are possibly result from unresolved incident irradiance variability during the 4-hour period over which the data are averaged.