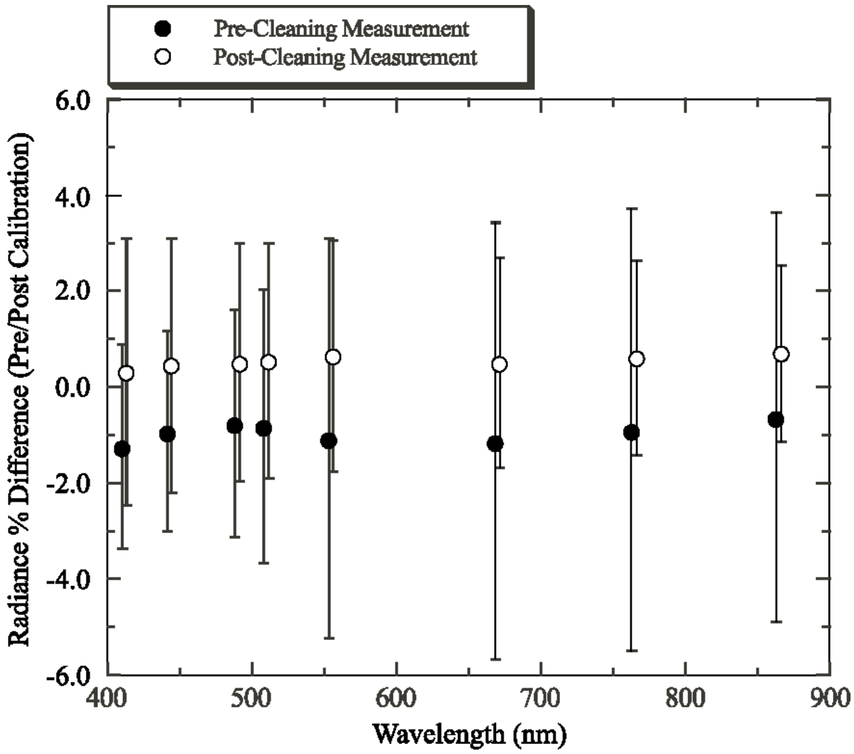

Figure 2.12: An example showing results of diver-deployed underwater radiometric stability source tests for several wavelengths and one radiance collector. The measurements were made immediately before, and after, the diver cleaned the radiance collector. The data are charted as percent differences from the similar test done on the day the buoy was deployed, approximately 2 months earlier.

Stray Light Characterization

A critical issue in ocean color measurements arises because of the large difference in the relative spectral shape of the lamp-illuminated ISS (radiance mode), or the FEL lamp (irradiance mode), when compared to the relative spectral shape of $L_u(z,\lambda)$, or $E_d(z,\lambda)$, measured in the ocean. Radiometric sensors do not have an ideal spectral selectivity, *i.e.*, the response at a wavelength of interest to flux at other wavelengths is small but finite (Vol. II, Chapter 2, Sect. 2.2 and Vol. II, Chapter 3, Sect. 3.4). As a result, measurements at the wavelength of interest include both a component that is proportional to the flux at that wavelength (*e.g.*, the "in-band" component) plus a component that sums the product of the sensor response and the spectrum of flux at wavelengths outside the in-band region. The latter sum, representing the out-of-band component, must be evaluated for all wavelengths for which the detector has finite responsivity. For MOS, the out-of-band response is largely determined by the scattering properties of the grating and unwanted reflections of flux diffracted in second order. We refer to the effect as "stray light".

Stray light considerations for MOS motivated dividing the spectrum into two regions using a dichroic beamsplitter and two spectrographs. As seen by the blue spectrograph, this division results in a better match between the spectral shapes of the FEL-type spectral irradiance sources and $E_d(z,\lambda)$, or the ISSs and $L_u(z,\lambda)$, and minimizes stray light effects in the critical ocean color wavelength bands. At 412 nm and 440 nm, for example, comparisons of $L_u(z,\lambda)$ for MOCE or MOBY deployments agree with measurements using independent filter radiometers to within ±5 %.

The effect of stray light in MOS is most evident in the region of overlap between the two spectrographs, from 545 nm to 650 nm. For the red spectrograph, the decreased transmittance of the dichroic beamsplitter in this region, where it goes from zero to nearly unity transmittance, means that the ratio of the in-band to the out-of-band components is unfavorable. Indeed, for some MOS wavelengths (CCD columns) at the blue side of the red