Table 4. Mean Extraterrestrial Solar Irradiance

Wavelength, nm	$\overline{F_o}$ μW cm^{-2} nm^{-1}
*SeaWiFS Bands**	
412	170.7943
443	189.4438
490	193.6842
510	188.3675
555	185.3973
670	153.3877
765	122.5128
865	99.0214
OCTS Bands†	
412	170.96
443	188.17
490	194.59
520	185.74
565	184.49
670	153.12
765	122.61
865	98.55

*H. Gordon, personal communication, 1998.
†Advance Earth Observing Satellite (ADEOS). OCTS Data Processing Algorithms Description version 2.01, NASDA, June 1997.

transformed data yielded the following equation (n = 2262; R^2 = 0.993):

$$[C + P] = 1.34*C^{0.983} \quad (1)$$

It is acknowledged that C and [C + P] cannot be considered as completely independent variables in the above regression. The major benefit of this approach is to allow the derivation of a chlorophyll/[C + P] relationship from a more stable basis than one based on chlorophyll versus phaeopigment. Because (1) yielded C/[C + P] ratios comparable to other reported ratios [e.g., *Smith and Baker*, 1978; *Morel and Berthon*, 1989; *Balch et al.*, 1992], it was used to estimate the [C + P] concentration for stations where the complete fluorometric information was missing (n = 471).

3.4. Radiometric Data Adjustments

For algorithms that required normalized water-leaving radiances as input, Rrs was multiplied by the mean extraterrestrial solar irradiance [*Neckel and Labs*, 1984] weighted by the spectral response of the relevant sensor bands (see Table 4). In addition, because the wavelengths required by the various algorithms (Table 2) did not always match those available in the SeaBAM data (Table 3), several radiometric adjustments were applied to some data sets. These adjustments were aimed to enhance the consistency of the algorithm comparison by testing all algorithms using the full dynamic range of available radiance data (n = 919).

For the first three shorter wavelengths the maximum difference between data and bands required by the various algorithms is 2 nm and was considered negligible. The major differences occur for algorithms that require either 510 or 520 nm data, while SeaBAM contains a mixture of these pairs of measurements. Similar mismatches exist between algorithms using either 550, 555, or 565 nm data and SeaBAM data which are comprised of a mix of these three wavelengths.

3.4.1. 565–555 nm. Even though chlorophyll absorbs light weakly in the 550–565 nm region and the Rrs spectrum is relatively insensitive to changes in C concentration at these wavelengths, 555 and 565 nm data are not interchangeable. This is particularly evident at low C concentrations, where for example, substituting Rrs565 for Rrs555 in a band ratio would give anomalously higher reflectance ratios than those expected for the clearest waters, based on backscattering data derived from *Morel* [1974] and recent absorption coefficients for pure seawater from *Pope and Fry* [1997].

The feasibility of estimating Rrs555 from measurements of Rrs565 was explored using BBOP94-95 data which have concurrent measurements at both wavelengths. A strong linear relationship was found (n = 78; R^2 = 0.975):

$$Rrs555 = 1.0628*Rrs565 + 0.0002 \quad (2)$$

Equation (2) was therefore applied to the BBOP92-93 Rrs565 data, to generate proxy estimates of Rrs555, and to the WOCE data set, which has a narrow range of low C concentrations very similar to the BBOP data (Figure 1).

3.4.2. Other radiometric adjustments. Two algorithms, OCTS-C and POLDER, use radiance data at 565 nm instead of 555 nm (Table 2). It is inappropriate to invert (2) to generate proxy Rrs565 from Rrs555 data because its applicability is restricted to the low C concentrations (<0.4 μg L^{-1}) used in its derivation. Another approach was thus used to convert between 555 and 565 nm and between 510 and 520 nm data. It uses the reflectance ratios predicted at any given C concentration by the semianalytic model of *Morel* [1988] adapted with *Pope and Fry* [1997] a_w data. These predicted reflectance ratios are shown in Figure 2 along with those predicted by the semianalytic model of *Gordon et al.* [1988]. According to these models, the Rrs555/Rrs565 reflectance ratio decreases from ~1.13 to ~0.97 as C increases from 0.015 to 7 μg L^{-1}, whereas for the same concentration range, Rrs510/Rrs520 varies from ~1.32 to ~0.95. Contrary to the 555–565 nm region, the 510–520 nm domain is highly influenced by pigment absorption and is thus more variable. The Rrs510/Rrs520 versus C and Rrs555/

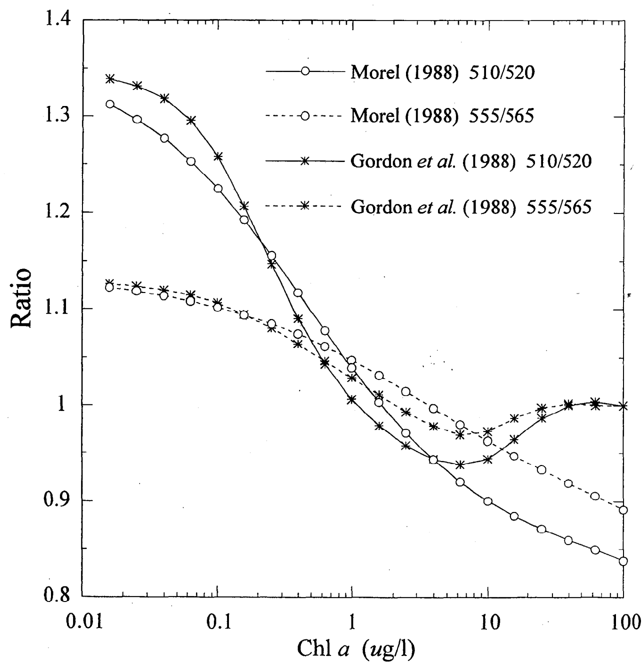

Figure 2. Ratios of Rrs510/Rrs520 and Rrs555/Rrs565 predicted from semianalytic models of *Morel* [1988] and *Gordon et al.* [1988] as a function of [Chl a].