Ocean Optics Protocols for Satellite Ocean Color Sensor Validation, Revision 4, Volume IV, Err. 1

Inherent Optical Properties: Instruments Characterizations, Field Measurements and Data Analysis Protocols

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Replace page 4 with the attached page, which contains a corrected version of Table 1.1.

The original Table 1.1 mistakenly contained values of water absorption $a_w(\lambda)$ taken from Pope's PhD thesis (Pope 1993), rather than the currently accepted values from Pope and Fry (1997), which were derived by additional analyses of Pope's measurements to reduce the uncertainties of reported values. The attached (revised) version of Table 1.1 (Err. 1) contains $a_w(\lambda)$ taken from Pope and Fry (1997) from 400 nm to 715 nm, with the numbers of significant figures adjusted to match the stated precision and uncertainties of the reported values at each wavelength. In the original version of Table 1.1, the uniform listing at 4 decimal places truncated the actual values from 400 nm to 465 nm, and exceeded the precisions and uncertainties of the reported data (3 decimal places) at wavelengths > 640 nm.

On further reviewing the remaining $a_w(\lambda)$ entries at other wavelengths in the original Table 1.1, it was discovered that the listed values of $a_w(\lambda)$ at wavelengths > 720 nm, as derived from the complex refractive indices reported by Kou *et al*. (1993), were simply "nearest neighbor" values, rather than interpolations to the stated wavelengths. These values were recomputed, interpolated to 5 nm intervals using a least squares cubic polynomial fit, and entered using the number of significant figures appropriate to the values reported by Kou *et al*. (1993). Kou *et al*. (1993) reported measured refractive index values, and 1-standard deviation relative uncertainties $\sigma(\lambda)$, at more than 60 wavelengths spanning 715 nm to 800 nm. The cubic polynomial fit used to interpolate the data in Table 1.1 matched $a_w(\lambda)$, as directly calculated from the reported data, within $< 0.5\sigma(\lambda)$ at all but 4 wavelengths, and those 4 larger differences were all $< 0.9\sigma(\lambda)$.

The transition from the reported data of Pope and Fry (1997) to that of Kou *et al*. (1993) occurs at 720 nm, where the value reported in Table 1.1 (Err. 1) represents the average of the two. The rationale for this selection lies with the reported uncertainties of the two data sources. Pope and Fry (1997) reported a uniform relative uncertainty of 3% over the range 715 nm to 727.5 nm, the longest wavelength for which they reported measured pure water absorptions. Kou *et al*. (1993) reported a relative uncertainty of 3% at 720 nm, increasing monotonically with decreasing wavelength to 3.6 % at 715 nm, and decreasing monotonically with increasing wavelength to 2.5 % at 725 nm. On this basis we used values of Pope and Fry (1997) at 715 nm, Kou *et al*. (1993) at 725 nm, and averaged the two at 720 nm. This averaging was done prior to fitting the cubic polynomials used to interpolate the reported data at wavelengths > 715nm.

REFERENCES

Pope, R.M., 1993: *Optical absorption of pure water and seawater using the integrating cavity absorption meter*, Ph.D. Thesis, Texas A & M, College Station, TX.

Pope, R.M. and E.S. Fry. 1997: Absorption spectrum (380-700 nm) of pure water. II. Integrating cavity measurements. *Appl. Opt*. **36**: 8710-8723.

Kou, L., D. Labrie and P. Chylek, 1993: Refractive indices of water and ice in the 0.65 to 2.5 μm spectral range, *Appl. Opt*., **32:** 3531-3540.

Table 1.1: Volume absorption and scattering coefficients for pure water, $a_w(\lambda)$ and $b_w(\lambda)$, respectively. Values for $a_w(\lambda)$ are those of Sogandares and Fry (1997) [340 to 390 nm], Pope and Fry (1997) [400 to 715 nm], and are computed from the complex refractive index measurements of Kou *et al*. (1993) [720 to 750 nm]. Alternative values of $b_w(\lambda)$ compared here are denoted (B) (Buitveld, *et al*. 1994) and (M) (Morel 1974). The linear temperature dependence of pure water absorption, $\frac{\partial a_w(\lambda)}{\partial T}$, is due to Pegau and Zaneveld (1993) and Pegau *et al*. (1997).

l	a_w	¶a_w(**l**) / ¶T	b_w	b_w
nm	**m^{-1}**	**m^{-1} °C**	**m^{-1} (B)**	**m^{-1} (M)**
340	0.0325	0.0000	0.0104	0.0118
350	0.0204	0.0000	0.0092	0.0103
360	0.0156	0.0000	0.0082	0.0091
370	0.0114	0.0000	0.0073	0.0081
380	0.0100	0.0000	0.0065	0.0072
390	0.0088	0.0000	0.0059	0.0065
400	0.00663	0.0000	0.0053	0.0058
405	0.00530	0.0000	0.0050	
410	0.00473	0.0000	0.0048	0.0052
415	0.00444	0.0000	0.0045	
420	0.00454	0.0000	0.0043	0.0047
425	0.00478	0.0000	0.0041	
430	0.00495	0.0000	0.0039	0.0042
435	0.00530	0.0000	0.0037	
440	0.00635	0.0000	0.0036	0.0038
445	0.00751	0.0000	0.0034	
450	0.00922	0.0000	0.0033	0.0035
455	0.00962	0.0000	0.0031	
460	0.00979	0.0000	0.0030	0.0031
465	0.01011	0.0000	0.0028	
470	0.0106	0.0000	0.0027	0.0029
475	0.0114	0.0000	0.0026	
480	0.0127	0.0000	0.0025	0.0026
485	0.0136	0.0000	0.0024	
490	0.0150	0.0000	0.0023	0.0024
495	0.0173	0.0001	0.0022	
500	0.0204	0.0001	0.0021	0.0022
505	0.0256	0.0001	0.0020	
510	0.0325	0.0002	0.0019	0.0020
515	0.0396	0.0002	0.0018	
520	0.0409	0.0002	0.0018	0.0019
525	0.0417	0.0002	0.0017	
530	0.0434	0.0001	0.0017	0.0017
535	0.0452	0.0001	0.0016	
540	0.0474	0.0001	0.0015	0.0016
545	0.0511	0.0001	0.0015	
550	0.0565	0.0001	0.0014	0.0015
555	0.0596	0.0001	0.0014	
560	0.0619	0.0001	0.0013	0.0014
565	0.0642	0.0001	0.0013	
570	0.0695	0.0001	0.0012	0.0013
575	0.0772	0.0002	0.0012	
580	0.0896	0.0003	0.0011	0.0012
585	0.1100	0.0005	0.0011	
590	0.1351	0.0006	0.0011	0.0011
595	0.1672	0.0008	0.0010	
600	0.2224	0.0010	0.0010	0.0011
605	0.2577	0.0011	0.0010	
610	0.2644	0.0011	0.0009	0.0010
615	0.2678	0.0010	0.0009	
620	0.2755	0.0008	0.0009	0.0009
625	0.2834	0.0005	0.0008	
630	0.2916	0.0002	0.0008	0.0009
635	0.3012	0.0000	0.0008	
640	0.3108	-0.0001	0.0008	0.0008
645	0.325	0.0000	0.0007	
650	0.340	0.0001	0.0007	0.0007
655	0.371	0.0002	0.0007	
660	0.410	0.0002	0.0007	0.0007
665	0.429	0.0002	0.0006	
670	0.439	0.0002	0.0006	0.0007
675	0.448	0.0001	0.0006	
680	0.465	0.0000	0.0006	0.0006
685	0.486	-0.0001	0.0006	
690	0.516	-0.0002	0.0006	0.0006
695	0.559	-0.0001	0.0005	
700	0.624	0.0002	0.0005	0.0005
705	0.704	0.0007	0.0005	
710	0.827	0.0016	0.0005	0.0005
715	1.007	0.0029	0.0005	
720	1.255	0.0045	0.0005	0.0005
725	1.539	0.0065	0.0004	
730	1.983	0.0087	0.0004	0.0005
735	2.495	0.0108	0.0004	
740	2.787	0.0122	0.0004	0.0004
745	2.836	0.0119	0.0004	
750	2.857	0.0106	0.0004	0.0004