

Errata for

Hydrologic Optics

by

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These notes are derived from Rudy Preisendorfer's personal set of *Hydrologic Optics*, which has the errata penciled onto the page margins. I compiled his errata for inclusion in the CD reprint of the original hardcopy volumes, which is being published by the Office of Naval Research. The errata are organized by volume and page number. Generally I show only the correct text or equation, without additional comment. Enjoy!

Curtis D. Mobley
July 2002

Volume I: Introduction

p 11, Fig 1.5(d): $\frac{P(S, \Xi(\xi))}{A(S)} = H(x, \xi)$

p 96, line 5: Each of the three paths has an...

p 96, fifth equation (T is the script T of HO):

$$\bar{T}_o = \left(1 - e^{-\frac{\tan^2 \phi}{2\sigma^2}} \right) \quad \text{where } \phi = A\psi, \text{ approximately}$$

p 97, line 20: (which was moored in deep calm homogeneous water...)

p 99, 12 lines from the bottom: contrast C_o of the mug against its background.

p 102, Eq. (86): $\alpha - K = \frac{1}{d} \ln \left(\frac{R'}{R} \right)$

p 107, 4 lines from bottom: = 12,802 (relative value)

p 107, last line: =18,030 (relative value)

p 122, line 13: parallelepiped whose dimensions are...

p 126, Table 1. Note added: Wratten #57: 460-620, peak at 520 nm
Wratten #61: 480-600, peak at 520 nm

p 128, Table 3. Note added: Wratten #45: 440-540, peak at 480 nm

p 131, Table 4, column 5: The wave length for the Sasaki (1960) data is 652 mμ

p 135, line 4: ...which generally depend on the geometrical structure of the light field (i.e., whether the light field is more or less collimated or diffuse) but not on the magnitude, but which have enough regular...

p 150, line 7: Chromaticity coordinates x, y were computed...

p 161, Figure 1.84: All ordinates must be multiplied by 10, e.g., 0.06 on the scale marked $\alpha - K\cos\theta$ should be 0.6.

p 165, line 5: ...with the aid of Figure 1.85.

p 165, line 16: ...Figure 1.85 intersects...

p 165, line 26: ...nomograph (Figure 1.85) and ...

p 165, line 37: ...nomograph (Figure 1.84) is available.

p 184-192, Figures 1.98-1.106: All ordinates must be multiplied by 10, e.g., 0.01 on the scale marked $\alpha - K\cos\theta$ in the figures should be 0.1

p 210, ref 75: publication date is Feb 1960.

p 214: missing ref 306 is Tyler, J. E., W. H. Richardson, and R. W. Holmes, "Method for obtaining the optical properties of large bodies of water," J. Geophys. Res., 64, 667 (1959).

Volume II: Foundations

page 64, line 8 from the bottom: $\xi \cdot \xi_1 N_1 \Omega + \xi \cdot \xi_2 N_2 \Omega$

page 90, top: The equations should read

$$\begin{aligned} {}_1N &= \frac{1}{2}[I + Q] \\ {}_2N &= \frac{1}{2}[I - Q] \\ {}_3N &= \frac{1}{2}[I + U] \\ {}_4N &= \frac{1}{2}[I - V] \end{aligned}$$

page 97, Eq. 1: $N(S,D) = 8 \times 10^6 \text{ watts / m}^2 \times \text{steradian}$

page 143, last equation and 2 lines from bottom: “C(x)” should be “C(ξ)”

Volume III: Solutions

page 9, equation preceding Eq (2):

$$N_r(z, \xi) = N_o(z_o, \xi) e^{-\alpha r} + \frac{N_*(z_o, \xi) e^{-\alpha r}}{\alpha + K \cos \theta} [\exp\{(\alpha + K \cos \theta)r\} - 1]$$

page 9, Eq. (2):

$$N_r(z, \xi) = N_o(z_o, \xi) e^{-\alpha r} + \frac{N_*(z, \xi)}{\alpha + K \cos \theta} [1 - e^{-(\alpha + K \cos \theta)r}]$$

page 17, Eq. (15):

$$N_r = N_o T_r[-\alpha] + \frac{N_*}{\alpha - \xi \cdot \mathbf{K}} (1 - T_r[-(\alpha - \xi \cdot \mathbf{K})])$$

page 164, the a = 2 equation:

$$C(2,0) \frac{\partial F_1^0}{-\partial z} + \dots$$

page 172, line 27: for the unknown complex valued functions F_a^b , $0 \leq a \leq m$, ...

page 198, 9 lines from bottom: ...present case. As in the plane-parallel case, ...set up by the point source in the surrounding medium.

Volume IV. Imbeddings

page 16, Eq. (63):

$$\lim_{y \rightarrow b} \frac{dN_+^*(y)}{dy} = -N_-^o(a) [T^*(a,b) \rho(b) + T^o(a,b) \rho(b)]$$

page 17, Eq. (68):

$$-\frac{\partial T^*(a,b)}{\partial a} = [\tau(a) + R(a,b) \rho(a)] T^*(a,b) + [\tau^*(a) + R(a,b) \rho(a)] T^o(a,b)$$

page 42, fourth equation from bottom (M is the script M of HO): The left-hand side is

$$[C_+ + M(z,x) C_-]^{-1} = [\dots]$$

page 42, Eq. (27) (M is the script M of HO):

$$T(z,x) = M_{++}(z,x) - M_{+-}(z,x) M_{--}^{-1}(z,x) M_{-+}(z,x)$$

page 80, line 4 and Eq. (34): all “M” are the script M

page 80, line after Eq. (34): Replacing $M(z,x)$ and $M(x,z)$ in (34) by either of their representations,... {script M's}

page 127, line 9: ... radiance distributions at the surface....

page 128, line 1: Let us write “ a_ℓ ” for the ℓ^{th} column of P,...

page 128, line 2: Then the system of 2m limits (30) can be

Volume V. Properties

page 18, Eq. (29):

$$II^* \quad H^*(y, -) = H^*(x, -) T(x, y) + H^*(y, +) R(y, x) \\ + H^o(x, -) T^*(x, y) + H^o(y, +) R(y, x)$$

page 28, Eq. (3):

$$\int_{\Xi_-} N(z, \xi) [D(-) |\xi \cdot \mathbf{k}| - 1] d\Omega(\xi) = 0$$

page 60, 2 lines below Eq. (47): (in other words,...

page 64, Eq. (21):

$$\Delta(x, z) = \Delta(0, z-x) e^{+(k_+ + k_-)x} = \Delta(z-x) e^{+(k_+ + k_-)x}$$

page 118, 5 lines from bottom:

$$-R(z, -) K(z, +) + K(z, -) = a(z) [D(z, +) R(z, -) + D(z, -)]$$

page 120, footnote: ...important roles in the associated radiative transfer process. In this case, transpectral scattering theory (cf. Sec. 19 of [251]) is the appropriate theory to use.

page 130, Eq. (7):

$$\int_0^{a+\Delta} f dz = \int_0^a f dz + \int_a^{a+\Delta} f dz$$

page 157, Eq. (6):

$$\int_{R(z_1, -)}^{R(z_2, -)} \frac{dt}{b(t, +) t^2 - c(t) t + b(t, -)} = (z_2 - z_1)$$

page 167, 3 lines from bottom: ...and $\wp_r(x_1, \xi_1)$ and $\wp_r(x_2, \xi_2)$ are two paths of $C(A, B)$,...

page 226, 8 lines from bottom:

$$K_\infty(\mu_1, \varphi_1) = \inf \{ K_\infty(\mu, \varphi) : (\mu, \varphi) \in \Xi_-(\varepsilon) \}$$

page 233, Eq. (8):

$$N(z, \theta, \varphi) = g(\theta, \varphi) e^{-k_n z}$$

page 236, 9 lines from bottom:

This completes the proof. [It is implicitly assumed that $K(z, \theta, \varphi)$ does not oscillate about some mean value with depth, so that $\lim_{z \rightarrow \infty} K(z, \theta, \varphi)$ exists.]

page 253, 13 lines from bottom:

An Heuristic Proof of the Hypothesis

page 265, Eq. (5):

$$\mp \frac{dH(z, \pm)}{dz} = - [a(z, \pm) + b(z, \pm)] H(z, \pm) + b(z, \mp) H(z, \mp)$$

page 268, 4 lines from bottom:

$$D(z, \pm) = \frac{h(z, \pm)}{H(z, \pm)}$$

Volume VI. Surfaces

page 12, 10 lines from bottom:

where \mathbf{e}_\parallel and \mathbf{e}_\perp are unit vectors parallel and perpendicular

page 13, line 18:

To convert from radians to degrees,...

page 16, line 7:

... n^2 -law for radiance ((4) of Sec. 2.6)....

page 43, line 5:

...to $N_0(x, \xi'')$ in (20)...

page 46, line 8 of second paragraph: ...the motion of the fluid packet at x ...

page 58, line 24:

...and surface tension T_1 (force per unit boundary length)....

page 58, 11 lines from bottom:

Here T_1 is the force per unit length so that $T_1 a$ is the total force acting...

page 61, figure 12.14 caption:

...over the xy plane.

page 94, equations below Eq. (28):

“ u_j ” for $\pi m/p$
“ v_j ” for $\pi n/p$
“ σ_j ” for $\pi \sigma_{mn}$

page 103, 6 lines from bottom:

$$\int_{E_2} |\zeta(\mathbf{x},s) - \zeta(\mathbf{x},t)|^2 dV(\mathbf{x})$$

page 105, 6 lines from bottom: ... over the set $S_r(\mathbf{x})$ or $S_r(\mathbf{k})$.

page 108, 2 lines above Eq. (51): ... common area πq^2 of $S_q(0)$

page 110, 2 lines above footnote: ... for each positive integer n (with dimension L^{-1}) and

page 111, Eq. (60):

$$\bar{E}(\mathbf{k},t;s) = \frac{1}{4\pi^2} \int_{S_s(\mathbf{k})} \left[\int_{E_2} \varphi(\mathbf{x},t) e^{-i(\mathbf{x}\cdot\mathbf{k}')} dV(\mathbf{x}) \right] dV(\mathbf{k}')$$

page 112, last line: Thus, analogously to (34), we have from (56):

page 113, equation after Eq. (64):

$$\begin{aligned} A_n(\mathbf{k},t;s) &= \lim_{r \rightarrow \infty} \frac{1}{2\pi} \int_{S_r(0)} \zeta_n(\mathbf{x},t) \left[\int_{S_s(0)} e^{-i(\mathbf{x}\cdot\mathbf{k}')} dV(\mathbf{k}') \right] \cdot e^{-i(\mathbf{x}\cdot\mathbf{k})} dV(\mathbf{x}) \\ &= \frac{1}{2\pi} \int_{S_s(\mathbf{k})} \left[\int_{E_2} \zeta_n(\mathbf{x},t) e^{-i(\mathbf{x}\cdot\mathbf{k}')} dV(\mathbf{x}) \right] dV(\mathbf{k}') \end{aligned}$$

page 116: Eq. (73) should be boxed to emphasize its importance.

page 116, line 8: The autocorrelation function φ is now to be defined by an averaging process over both the \mathbf{x} -plane and the time domain....

page 120, line 5: (73), (75), (79), and (80)....

page 136, Eq. (12):

$$\cos \tau = \frac{\cos d - \cos \theta}{A(\omega, \theta, d)}$$

page 146, 4 lines from bottom: ... use (89)-(91) of Sec. 12.4 to write:

page 149, line 2: ... we shall set $\sigma_c = \sigma_u = \sigma$ in (28)

page 159, line 21: ...find the average: $\bar{H}_{1/3} = \dots$

page 171, last line of footnote: ...our $E(u,v)$ with $[A^*(\alpha,\beta)]^2/2...$

page 172, Fig 12.44: The curve labeled “theoretical Neumann spectrum” is actually the “wave pole spectrum” and vice versa.

page 188, line 4: The coefficient of U_a^5 works out to be

page 188, line 7: The units of m_{00} are m^2

page 188, Eq. (11):

$$m_{20} = m_{02} = \frac{C\pi^3}{2g} \sqrt{\frac{\pi}{2}} U_a$$

page 188, Eq. (12):

$$\sigma_c^2 = \sigma_u^2 = 1.64 \cdot 10^{-3} U_a$$

page 190, Eq. (16):

$$T_\sigma = a \sigma^{-p} e^{-\left(\frac{b}{\sigma U_a}\right)^q}$$

page 195: Fig 12.53 is upside down

page 197, line 11: ...m is simply the mean square deviation m_{00} of the elevation

page 199, 4 lines from bottom: The establishment of (16)....

page 216, line 7 from bottom: ... and call $\hat{N}_+(\hat{x},\hat{\xi})$ the upward

page 222, line 9 from bottom: With (10) in effect and adopting (11) - (15), equation (8) becomes:

page 234, line 3: ... (recall, e.g., (10) of Sec. 12.8).

page 252, line 15: The equation

$$Q^o(\hat{x},\hat{\xi}) + Q_+(\hat{x},\hat{\xi}) = 1$$

is Eq. (6).

page 263, 3 lines from bottom:

$$A = A_1(1 + k_1 + k_1k_2 + \dots + k_1k_2 + k_m) \equiv A_1K_m$$

page 327, line 3 of “Discussion of the Reflectance Functions” section: ... so that $R(z,-)$

page 332, Eq. (8):

$$T(|z-x|) = \frac{H(x,-)H(z,-) - H(x,+)H(z,+)}{H^2(x,-) - H^2(z,+)}$$

page 334, line just above Eq. (18): ...by means of the relation:

page 335, line 3: A perusal of (22) and (23) of Sec. 8.6 shows....

page 336, 7 lines from bottom:

$$k = [aD(aD + 2b)]^{1/2}$$

page 339, line 14: ... difficulties in hydrological optics....

page 358, reference 174: “Über Zerstreung und Beugung des Lichtes....”

page 359, reference 189: December 1953.