After allowing for typographical errors and missing explanations, Bowditch 2002 gives

Distance by Vertical Angle Measured Between Sea Horizon and Top of Object Beyond Sea Horizon

$$\mathrm{D} = \sqrt{\left(\frac{\tan\alpha}{0.0002419}\right)^2 + \frac{\mathrm{H}-\mathrm{h}}{0.7349}} - \frac{\tan\alpha}{0.0002419}$$

in which D is the distance in nautical miles, a is the corrected vertical angle, H is the height of the top of the object above sea level in feet, and h is the height of eye of the observer above sea level in feet. The constants 0.0002419 and 0.7349 account for terrestrial refraction.

Setting H = 0 and solving for tan α gives the "exact" result

$$\mathrm{Ds} = 60\tan^{-1}\left(\frac{\mathrm{h_f}}{6076.1\mathrm{d_s}} + \frac{\mathrm{d_s}}{8268}\right)$$

For the small angles concerned (and retaining the excess of digits) this is gives the "approximate" form

$$\mathrm{Ds} = 0.56578\frac{\mathrm{h_f}}{\mathrm{d_s}} + 0.4158\mathrm{d_s}$$

Within the "refraction model" that scales the Earth's radius everywhere to $r = \dfrac{10800}{\pi}\left(\dfrac{1}{1-\beta}\right) = 8268\,\mathrm{nmi}$ for $\beta = 0.1684$ the exact dip short formula is

$$\begin{aligned}\tan\mathrm{Ds} &= \frac{h}{r}\csc\left(\frac{d_s}{r}\right) + \left(1-\cos\left(\frac{d_s}{r}\right)\right)\csc\left(\frac{d_s}{r}\right)\\ &\approx \frac{h}{d_s} + \frac{d_s}{2r} + \ldots\end{aligned}$$

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