Based on "Hydrodynamics" lecture notes by MIT Prof. A.H. Techet

Equation 7.39: Pressure \( (x,z,t) = [\rho, g, N(x, t), (g)] \cdot \left[ \frac{\cosh(k(z + H_t))}{\cosh(kH)} \right] = [\rho, g, N(x, t), (g)] \cdot \left[ \frac{\cosh\left(\frac{2\pi(z_{\lambda} + H_{\lambda})}{H_{\lambda}}\right)}{\cosh\left(\frac{2\pi H_{\lambda}}{H_{\lambda}}\right)} \right]

Where \( \lambda = \text{wave's wavelength} \quad k = \frac{2\pi}{\lambda} \quad H = \text{Total depth of water} \quad H_{\lambda} = \frac{H}{\lambda} \quad z = \text{Depth in that water} \quad z_{\lambda} = \frac{z}{\lambda}

Equation's first term, \( \rho, g, N(x, t) \), is pressure variation at the base of the surface wave (i.e., at \( z = 0 \)).

Second term scales pressure variation to depths below \( z = 0 \):

\[
P_{\text{scale}}(z_{\lambda}, H_{\lambda}) := \frac{\cosh\left(\frac{2\pi(z_{\lambda} + H_{\lambda})}{H_{\lambda}}\right)}{\cosh\left(\frac{2\pi H_{\lambda}}{H_{\lambda}}\right)}
\]

Truncating that scaling function at the sea bottom (i.e., at \( z_{\lambda} = -H_{\lambda} \)):

\[
P_{\text{truncated}}(z_{\lambda}, H_{\lambda}) := \left( z_{\lambda} + H_{\lambda} > 0 \right) P_{\text{scale}}(z_{\lambda}, H_{\lambda})
\]