Notes on the function

\texttt{gsw\_sigma1(SA,CT)}

Potential density anomaly is defined by Eqn. (3.6.1) of IOC \textit{et al.} (2010), namely

\[
\sigma^\theta(S, t, p, p_r) = \rho^\theta(S, t, p, p_r) - 1000 \text{ kg m}^{-3} \\
= \hat{\rho}(S, \Theta, p_r) - 1000 \text{ kg m}^{-3}. \tag{1}
\]

This function, \texttt{gsw\_sigma1}(SA,CT), evaluates the potential density anomaly of seawater as a function of Absolute Salinity and Conservative Temperature, and with respect to a reference pressure \( p_r \) of 1000 dbar using the 75-term expression, \( \hat{\nu}(S, \Theta, p) \) of the GSW function \texttt{gsw\_specvol}(SA,CT,p). This 75-term polynomial expression for specific volume is discussed in Roquert \textit{et al.} (2015) and in appendix A.30 and appendix K of the TEOS-10 Manual (IOC \textit{et al.} (2010)).

References


Here follows section 3.6 of the TEOS-10 manual (IOC \textit{et al.} (2010)).

3.6 Potential density anomaly

Potential density anomaly, \( \sigma^\theta \) or \( \sigma^\Theta \), is simply potential density minus 1000 kg m\(^{-3}\),

\[
\sigma^\theta(S, t, p, p_r) = \sigma^\Theta(S, t, p, p_r) = \rho^\theta(S, t, p, p_r) - 1000 \text{ kg m}^{-3} \\
= \rho^\Theta(S, t, p, p_r) - 1000 \text{ kg m}^{-3} \\
= g_p^{-1}(S, \Theta[S, t, p, p_r], p_r) - 1000 \text{ kg m}^{-3}. \tag{3.6.1}
\]

Note that it is equally correct to label potential density anomaly as \( \sigma^\theta \) or \( \sigma^\Theta \) because both \( \theta \) and \( \Theta \) are constant during the isentropic and isohaline pressure change from \( p \) to \( p_r \).