Notes on the function  
gsw\_sigma3(SA,CT)

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

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

(1)

This function, gsw\_sigma3(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 3000 dbar using the 75-term expression, \( \hat{\nu}(S_A,\Theta,p) \) of the GSW function gsw\_specvol(SA,CT,p). This 75-term polynomial expression for specific volume is discussed in Roquert et al. (2015) and in appendix A.30 and appendix K of the TEOS-10 Manual (IOC et al. (2010)).

References


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

3.6 Potential density anomaly

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

\[
\sigma^\Theta(S_A,t,p,p_r) = \sigma^\Theta(S_A,t,p,p_r) = \rho^\Theta(S_A,t,p,p_r) - 1000 \text{ kg m}^{-3}
\]

\[
= \rho^\Theta(S_A,t,p,p_r) - 1000 \text{ kg m}^{-3} = \hat{\rho}(S_A,\Theta,p_r) - 1000 \text{ kg m}^{-3}.
\]

(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 \( p_r \).