Notes on the function
gsw_sigma0(SA,CT)

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

$$\sigma^{\Theta}\left(S_{A},t,p,p_{r}\right) \;=\; \rho^{\Theta}\left(S_{A},t,p,p_{r}\right) - 1000 \text{ kg m}^{-3}$$
$$=\; \hat{\rho}\left(S_{A},\Theta,p_{r}\right) - 1000 \text{ kg m}^{-3}. \tag{1}$$

This function, **gsw_sigma0**(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 0 dbar using the 75-term expression, $\hat{v}(S_A,\Theta,p)$ 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

IOC, SCOR and IAPSO, 2010: *The international thermodynamic equation of seawater – 2010: Calculation and use of thermodynamic properties*. Intergovernmental Oceanographic Commission, Manuals and Guides No. 56, UNESCO (English), 196 pp. Available from http://www.TEOS-10.org

Roquet, F., G. Madec, T. J. McDougall and P. M. Barker, 2015: Accurate polynomial expressions for the density and specific volume of seawater using the TEOS-10 standard. Ocean Modelling, 90, pp. 29-43. http://dx.doi.org/10.1016/j.ocemod.2015.04.002

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

3.6 Potential density anomaly

Potential density anomaly, σ^{θ} or σ^{Θ}, is simply potential density minus 1000 kg m⁻³,

$$\sigma^{\theta}\left(S_{A},t,p,p_{r}\right) \;=\; \sigma^{\Theta}\left(S_{A},t,p,p_{r}\right) = \rho^{\theta}\left(S_{A},t,p,p_{r}\right) - 1000 \text{ kg m}^{-3}$$
$$=\; \rho^{\Theta}\left(S_{A},t,p,p_{r}\right) - 1000 \text{ kg m}^{-3} \tag{3.6.1}$$
$$=\; g_{P}^{-1}\left(S_{A},\theta\left[S_{A},t,p,p_{r}\right],p_{r}\right) - 1000 \text{ kg m}^{-3}.$$

Note that it is equally correct to label potential density anomaly as σ^{θ} or σ^{Θ} because both θ and Θ are constant during the isentropic and isohaline pressure change from p to p_r.