Notes on the function gsw_sigma0_pt0_exact(SA,pt0)

Potential density anomaly $\sigma^\Theta$ is defined by Eqn. (3.6.1) of IOC et al. (2010), namely

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

(1)

The present function, gsw_sigma0_pt0_exact(SA,pt0), calculates potential density with a reference pressure of 0 dbar, and uses the full TEOS-10 Gibbs function $g(S_A, t, p)$ of IOC et al. (2010), being the sum of the IAPWS-09 and IAPWS-08 Gibbs functions.

The temperature input to this function, pt0, is potential temperature $\Theta$ referenced to 0 dbar.

This function could have evaluated sigma0 by calling other GSW functions such as gsw_rho_t_exact or gsw_gibbs but we have chosen to write this function in terms of the actual coefficients of the TEOS-10 Gibbs function so that the present function is a stand-alone function. This will ease the adaption of this function to other computer languages.

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$^{-3}$,

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

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

(3.6.1)

$$= g_p^{-1}(S_A, \Theta[S_A, t, p, p_r], p_r) - 1000 \, \text{kg m}^{-3}.$$