Notes on the function gsw_alpha(SA,CT,p)

This function, **gsw_alpha**(SA,CT,p), evaluates the thermal expansion coefficient with respect to Conservative Temperature from the 75-term polynomial function expression for specific volume **gsw_specvol**(SA,CT,p). This 75-term polynomial expression for specific volume is discussed in Roquet *et al*. (2015) and in appendix A.30 and appendix K of the TEOS-10 Manual (IOC *et al*. (2010)).

This thermal expansion coefficient α^Θ is defined as

$$\alpha^\Theta = -\frac{1}{\rho}\frac{\partial \rho}{\partial \Theta}\bigg|_{S_A,p}, \tag{1}$$

and when evaluated from the 75-term computationally-efficient expression for specific volume, the rms error compared with the same thermal expansion coefficient evaluated directly from the TEOS-10 Gibbs function is $0.03x10^{-6}\,\mathrm{K}^{-1}$ in the "oceanographic funnel". This is to be compared with the rms error of the thermal expansion coefficient of the laboratory data to which the TEOS-10 Gibbs function was fitted of $0.73x10^{-6}\,\mathrm{K}^{-1}$. Hence we may take the thermal expansion coefficient α^Θ evaluated form **gsw_alpha**(SA,CT,p) as essentially reflecting the full accuracy of TEOS-10. The exact thermal expansion coefficient α^Θ can be evaluated from **gsw_alpha_CT_exact**(SA,CT,p).

Further comments on the 75-term polynomial expression for specific volume may be found in the Help file of **gsw_specvol**(SA,CT,p).

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

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