2.11 Internal energy

The specific internal energy of seawater u is given by (where T_0 is the Celsius zero point, 273.15 K and $P_0 = 101\,325\,\mathrm{Pa}$ is the standard atmosphere pressure)

$$u = u(S_A, t, p) = g + (T_0 + t)\eta - (p + P_0)v = g - (T_0 + t)\left.\frac{\partial g}{\partial T}\right|_{S_A, p} - (p + P_0)\left.\frac{\partial g}{\partial P}\right|_{S_A, T}. \qquad (2.11.1)$$

This expression is an example where the use of non-basic SI units presents a problem, because in the product $-(p + P_0)v$, $(p + P_0) = P$ must be in Pa if specific volume has its regular units of $\mathrm{m^3\,kg^{-1}}$:- hence here sea pressure p must be expressed in Pa. Also, the pressure derivative in Eqn. (2.11.1) must be done with respect to pressure in Pa.

Specific internal energy u has units of $\mathrm{J\,kg^{-1}}$ in both the SIA and GSW software libraries.