

## 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  $P_0 = 101\,325\text{Pa}$  is the standard atmosphere pressure)

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

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  $\text{m}^3 \text{kg}^{-1}$  :- 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  $\text{J kg}^{-1}$  in both the SIA and GSW software libraries.