2.21 Isochoric heat capacity

The specific isochoric heat capacity c_v is the rate of change of specific internal energy u with temperature at constant Absolute Salinity S_A and specific volume, v, so that

$$c_v = c_v\left(S_A, t, p\right) = \left.\frac{\partial u}{\partial T}\right|_{S_A, v} = -\left(T_0 + t\right)\left(g_{TT} g_{PP} - g_{TP}^2\right) \Big/ g_{PP} . \tag{2.21.1}$$

Note that the isochoric and isobaric heat capacities are related by

$$c_v = c_p - \frac{\left(T_0 + t\right)\left(\alpha^t\right)^2}{\left(\rho \kappa^t\right)}, \quad \text{and by} \quad c_v = c_p \frac{\kappa}{\kappa^t} . \tag{2.21.2}$$

The isochoric heat capacity c_v has units of $\text{J kg}^{-1}\ \text{K}^{-1}$ in both the SIA and GSW computer libraries.

See also section 2.20 of the TEOS-10 Manual below, on the isobaric heat capacity.

2.20 Isobaric heat capacity

The specific isobaric heat capacity c_p is the rate of change of specific enthalpy with temperature at constant Absolute Salinity S_A and pressure p, so that

$$c_p = c_p\left(S_A, t, p\right) = \left.\frac{\partial h}{\partial T}\right|_{S_A, p} = -\left(T_0 + t\right) g_{TT} . \tag{2.20.1}$$

The isobaric heat capacity c_p varies over the $S_A - \Theta$ plane at $p = 0$ by approximately 5%, as illustrated in Figure 4.

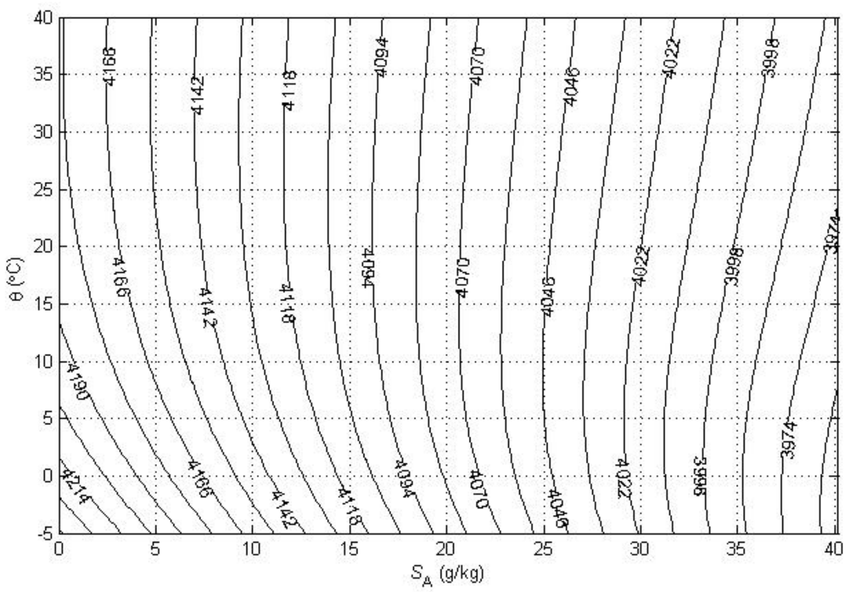

Figure 4. Contours of isobaric specific heat capacity c_p of seawater (in $\text{J kg}^{-1}\ \text{K}^{-1}$), Eqn. (2.20.1), at $p = 0$.

The isobaric heat capacity c_p has units of $\text{J kg}^{-1}\ \text{K}^{-1}$ in both the SIA and GSW computer libraries.