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

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

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

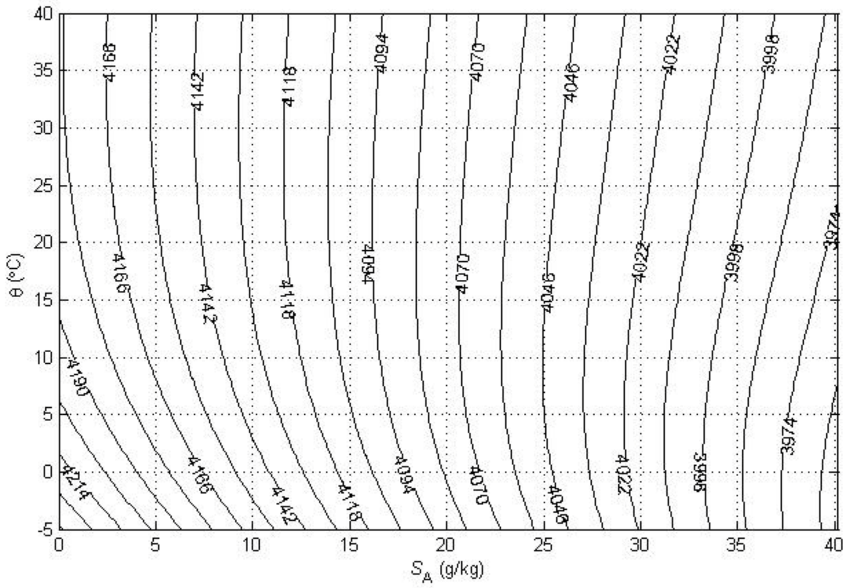

Figure 4. Contours of isobaric specific heat capacity c_p of seawater (in $\mathrm{J\ kg^{-1}\ K^{-1}}$), Eqn. (2.20.1), at $p = 0$.

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

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

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

Note that the isochoric and isobaric heat capacities are related by

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

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