Notes on the function gsw_dynamic_enthalpy_t_exact(SA,t,p)

Young (2010) has defined dynamic enthalpy $h^\dagger$ to be the difference between enthalpy and potential enthalpy, that is, $h - h^0 = h - c_p^0\Theta$. Hence dynamic enthalpy $h^\dagger$ is also equal to the following pressure integral of specific volume for a seawater parcel which does not exchange heat or salt as its pressure is changed during the integration,

$$\hat{h}^\dagger\left(S_A,\Theta,p\right) = h\left(S_A,\Theta,p\right) - c_p^0\Theta = \int_{P_0}^{P} \hat{v}\left(S_A,\Theta,p'\right)\,dP', \tag{1}$$

The lower limit of the integration is $P_0 \equiv 101\,325$ Pa and the pressure integral is done with pressure in Pa (not dbar). Enthalpy and dynamic enthalpy have units of J kg^{-1}.

This function, **gsw_dynamic_enthalpy_t_exact**(SA,t,p), evaluates dynamic enthalpy $h^\dagger$ in terms of the input variables Absolute Salinity S_A *in situ* temperature t and pressure p. This function uses the full TEOS-10 Gibbs function $g\left(S_A,t,p\right)$ of IOC *et al.* (2010), being the sum of the IAPWS-09 and IAPWS-08 Gibbs functions.

This function is essentially the following calls to two other GSW functions,

```
CT = gsw_CT_from_t(SA,t,p);
dynamic_enthalpy_t_exact = gsw_enthalpy_t_exact(SA,t,p) - cp0*CT;
```

References

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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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