Gibbs SeaWater (GSW) Oceanographic Toolbox of TEOS–10

Note that this is an abridged set of the GSW functions

Practical Salinity (SP), PSS-78

gsw_SP_from_C	Practical Salinity from conductivity, C (incl. for SP < 2)
gsw_C_from_SP	conductivity, C, from Practical Salinity (incl. for SP < 2)
gsw_SP_from_R	Practical Salinity from conductivity ratio, R (incl. for SP < 2)
gsw_R_from_SP	conductivity ratio, R, from Practical Salinity (incl. for SP < 2)
gsw_SP_from_SK	Practical Salinity from Knudsen Salinity

Absolute Salinity (SA) and Conservative Temperature (CT)

gsw_SA_from_SP	Absolute Salinity from Practical Salinity
gsw_CT_from_t	Conservative Temperature from in-situ temperature

Absolute Salinity – Conservative Temperature plotting function

gsw_SA_CT_plot	function to plot Absolute Salinity – Conservative Temperature profiles on the SA-CT diagram, including the freezing line and selected potential density contours

other conversions between temperatures, salinities, entropy, pressure and height

gsw_SP_from_SA	Practical Salinity from Absolute Salinity
gsw_pt_from_CT	potential temperature from Conservative Temperature
gsw_t_from_CT	in-situ temperature from Conservative Temperature
gsw_CT_from_pt	Conservative Temperature from potential temperature
gsw_pt_from_t	potential temperature
gsw_pt0_from_t	potential temperature with reference pressure of 0 dbar
gsw_t_from_pt0	in-situ temperature from potential temperature with p_ref of 0 dbar
gsw_t90_from_t48	ITS-90 temperature from IPTS-48 temperature
gsw_t90_from_t68	ITS-90 temperature from IPTS-68 temperature
gsw_z_from_p	height from pressure
gsw_p_from_z	pressure from height
gsw_z_from_depth	height from depth
gsw_depth_from_z	depth from height
gsw_adiabatic_lapse_rate_from_CT	adiabatic lapse rate from Conservative Temperature
gsw_adiabatic_lapse_rate_from_t	adiabatic lapse rate from in-situ temperature

specific volume, density and enthalpy

gsw_specvol	specific volume
gsw_alpha	thermal expansion coefficient with respect to CT
gsw_beta	saline contraction coefficient at constant CT
gsw_specvol_alpha_beta	specific volume, thermal expansion and saline contraction coefficients
gsw_specvol_first_derivatives	first derivatives of specific volume
gsw_specvol_anom	specific volume anomaly
gsw_specvol_anom_standard	specific volume anomaly realtive to SSO & 0°C
gsw_rho	in-situ density and potential density
gsw_sigma0	sigma0 with reference pressure of 0 dbar
gsw_sigma1	sigma1 with reference pressure of 1000 dbar
gsw_sigma2	sigma2 with reference pressure of 2000 dbar
gsw_sigma3	sigma3 with reference pressure of 3000 dbar
gsw_sigma4	sigma4 with reference pressure of 4000 dbar
gsw_cabbeling	cabbeling coefficient
gsw_thermobaric	thermobaric coefficient
gsw_sound_speed	sound speed

vertical stability

gsw_Nsquared	buoyancy (Brunt-Väisäla) frequency squared (N^2)

geostrophic streamfunctions, acoustic travel time and geostrophic velocity

gsw_geo_strf_dyn_height	dynamic height anomaly
gsw_geo_strf_isopycnal	approximate isopycnal geostrophic streamfunction
gsw_geo_strf_Cunningham	Cunningham geostrophic streamfunction
gsw_geo_strf_Montgomery	Montgomery geostrophic streamfunction
gsw_geo_strf_steric_height	dynamic height anomaly divided by 9.7963 m s^{-2}
gsw_travel_time	acoustic travel time
gsw_geostrophic_velocity	geostrophic velocity

seawater and ice properties at freezing temperatures

gsw_CT_freezing_poly	Conservative Temperature freezing temp of seawater (poly)
gsw_t_freezing_poly	in-situ freezing temperature of seawater (poly)

thermodynamic interaction between ice and seawater

gsw_frazil_ratios_adiabatic_poly	ratios of SA, CT and P changes during frazil ice formation (poly)
gsw_frazil_properties_potential_poly	SA, CT & ice fraction from bulk SA & bulk potential enthalpy (poly)

planet Earth properties

gsw_f	Coriolis parameter
gsw_grav	gravitational acceleration
gsw_distance	spherical earth distance between points in the ocean

Library functions of the GSW toolbox

gsw_linear_interp_SA_CT	linearly interpolates (SA,CT,p) to the desired p
gsw_rr68_interp_SA_CT	Reiniger & Ross (1968) interpolation of (SA,CT,p) to the desired p

The GSW Toolbox is available from

www.TEOS–10.org

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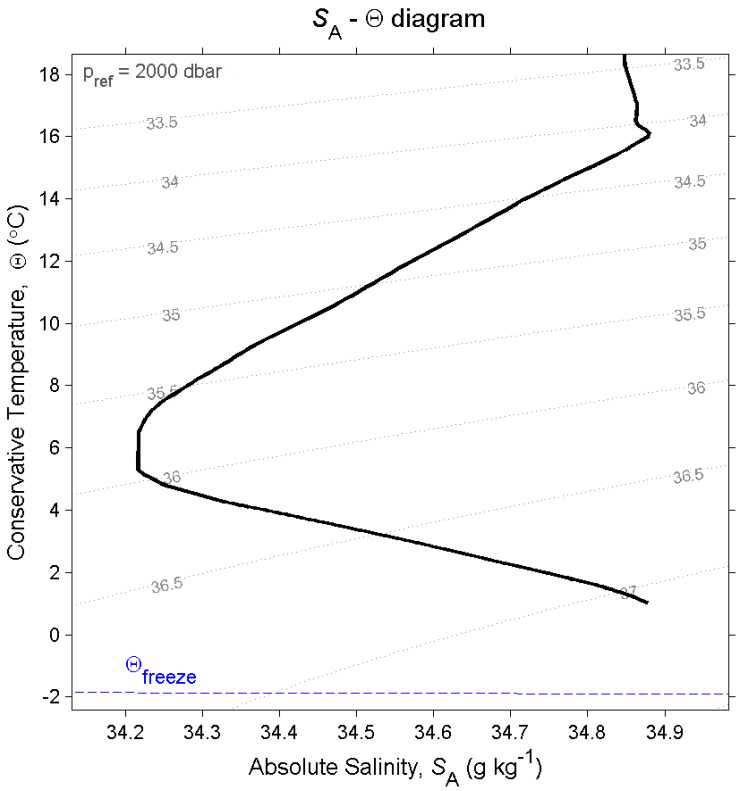
TEOS-10 and GSW in a nutshell

In order to analyse oceanographic data under TEOS-10, the observed values of Practical Salinity S_P and *in situ* temperature t need to be converted into Absolute Salinity S_A and Conservative Temperature Θ, as follows,

Step 1. calculate Absolute Salinity, S_A = **gsw_SA_from_SP**(SP, p, long, lat),

Step 2. calculate Conservative Temperature, Θ = **gsw_CT_from_t**(SA, t, p).

Having converted (S_P, t, p) to (S_A, Θ, p), the abridged list of GSW functions on the previous page are then used for analysing the data. The use of these GSW functions ensures consistency between theoretical oceanography, observational oceanography and ocean modelling.



Under TEOS-10, the $S_A - \Theta$ diagram is the new "T-S" diagram. The above $S_A - \Theta$ diagram was plotted using **gsw_SA_CT_plot**. The σ_2 potential density anomaly contours were evaluated inside this function using **gsw_rho**(SA,CT,2000). This same function can be used to evaluate *in situ* density via **gsw_rho**(SA,CT,p).