

This directory contains three files:

- 1) gsw_oceanographic_toolbox.f90
- 2) gsw_data_v3_0.dat
- 3) gsw_check_function.f90

File 1 gsw_oceanographic_toolbox.f90

Contains the subset of the Gibbs SeaWater (GSW) Oceanographic Toolbox of TEOS-10 (version 3.03) that has been rewritten in Fortran 90, as follows

Gibbs SeaWater (GSW) Oceanographic Toolbox of TEOS-10 version 3.03 (Fortran)

Practical Salinity, PSS-78

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|----------------|--|
| gsw_sp_from_c | - Practical Salinity from conductivity (inc. for SP < 2) |
| gsw_c_from_sp | - conductivity from Practical Salinity (inc. for SP < 2) |
| gsw_sp_from_sk | - Practical Salinity from Knudsen Salinity |

salinity and temperature conversions

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|----------------------------------|---|
| gsw_sa_from_sp | - Absolute Salinity from Practical Salinity |
| gsw_sstar_from_sp | - Preformed Salinity from Practical Salinity |
| gsw_ct_from_t | - Conservative Temperature from in-situ temperature |
| | |
| gsw_deltasa_from_sp | - Absolute Salinity Anomaly from Practical Salinity |
| gsw_sr_from_sp | - Reference Salinity from Practical Salinity |
| gsw_sp_from_sr | - Practical Salinity from Reference Salinity |
| gsw_sp_from_sa | - Practical Salinity from Absolute Salinity |
| gsw_sstar_from_sa | - Preformed Salinity from Absolute Salinity |
| gsw_sp_from_sstar | - Practical Salinity from Preformed Salinity |
| gsw_sa_from_sstar | - Absolute Salinity from Preformed 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_pt0_from_t | - potential temperature with reference pressure of 0 dbar |
| gsw_pt_from_t | - potential temperature |
| gsw_z_from_p | - height from pressure |
| gsw_entropy_from_t | - entropy from in-situ temperature |
| gsw_adiabatic_lapse_rate_from_ct | - adiabatic lapse rate from CT |

density and enthalpy, based on the 48-term expression for density

gsw_rho	- in-situ density from CT, and potential density
gsw_alpha	- thermal expansion coefficient with respect to CT
gsw_beta	- saline contraction coefficient at constant CT
gsw_alpha_on_beta	- alpha divided by beta
gsw_rho_first_derivatives	- first derivatives of density
gsw_specvol	- specific volume
gsw_specvol_anom	- specific volume anomaly
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_sound_speed	- sound speed
gsw_kappa	- isentropic compressibility
gsw_cabbeling	- cabbeling coefficient
gsw_thermobaric	- thermobaric coefficient
gsw_internal_energy	- internal energy
gsw_enthalpy	- enthalpy
gsw_dynamic_enthalpy	- dynamic enthalpy
gsw_sa_from_rho	- Absolute Salinity from density

water column properties, based on the 48-term expression for density

gsw_nsquared	- buoyancy (Brunt-Vaisala) frequency squared (N^2)
gsw_turner_rsubrho	- Turner angle & R_{subrho}
gsw_ipv_vs_fnsquared_ratio	- ratio of the vertical gradient of potential density (with reference pressure, p_{ref}), to the vertical gradient of locally-referenced potential density

freezing temperatures

gsw_ct_freezing	- Conservative Temperature freezing temperature of seawater
gsw_t_freezing	- in-situ temperature freezing temperature of seawater

isobaric melting enthalpy and isobaric evaporation enthalpy

gsw_latentheat_melting	- latent heat of melting
gsw_latentheat_evap_ct	- latent heat of evaporation with CT as input temperature
gsw_latentheat_evap_t	- latent heat of evaporation, with in-situ temperature as input

planet Earth properties

gsw_grav	- gravitational acceleration
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basic thermodynamic properties in terms of in-situ t , based on the exact Gibbs function

gsw_rho_t_exact	- in-situ density
gsw_pot_rho_t_exact	- potential density
gsw_alpha_wrt_t_exact	- thermal expansion coefficient with respect to in-situ temperature
gsw_beta_const_t_exact	- saline contraction coefficient at constant in-situ temperature
gsw_specvol_t_exact	- specific volume

gsw_sound_speed_t_exact - sound speed
 gsw_kappa_t_exact - isentropic compressibility
 gsw_enthalpy_t_exact - enthalpy
 gsw_cp_t_exact - isobaric heat capacity

library functions of the GSW toolbox

gsw_gibbs - the TEOS-10 Gibbs function and its derivatives
 gsw_saar - Absolute Salinity Anomaly Ratio (excluding the Baltic Sea)
 gsw_deltasasa_atlas - Absolute Salinity Anomaly atlas value (excluding the Baltic Sea)
 gsw_fdelta - ratio of Absolute to Preformed Salinity, minus 1
 gsw_sa_from_sp_baltic - Absolute Salinity from Practical Salinity in the Baltic Sea
 gsw_sp_from_sa_baltic - Practical Salinity from Absolute Salinity in the Baltic Sea
 gsw_entropy_part - entropy minus the terms that are a function of only SA
 gsw_entropy_part_zero - entropy_part evaluated at 0 dbar
 gsw_gibbs_pt0_pt0 - gibbs(0,2,0,SA,t,0)
 gsw_specvol_sso_0_p - specvol_CT at (35.16504,0,p)
 gsw_enthalpy_sso_0_p - enthalpy_CT at (35.16504,0,p)
 gsw_hill_ratio_at_sp2 - Hill ratio at a Practical Salinity of 2

File 2 gsw_data_v3_0.dat

Contains the global data set of Absolute Salinity Anomaly Ratio R^δ , and the global data set of Absolute Salinity Anomaly atlas. δS_A^{atlas} .

The data set gsw_data_v3_0.dat must not be tampered with.

File 3 gsw_check_function.f90

Contains the check functions. We suggest that after downloading, unzipping and installing the toolbox the user runs this program to ensure that the toolbox is installed correctly and there are no conflicts.

Installation.

This toolbox has been tested to compile and run with gfortran.

Compile and run commands, in gfortran:

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gfortran gsw_oceanographic_toolbox.f90 -c
gfortran gsw_check_functions.f90 -c
gfortran gsw_oceanographic_toolbox.o gsw_check_functions.o -o gsw
./gsw

```

Note that gfortran is the name of the GNU Fortran project, developing a free Fortran 95/2003/2008 compiler for GCC, the GNU Compiler Collection. It is available from

<http://gcc.gnu.org/fortran/>