

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) that has been rewritten in Fortran 90, as follows

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Gibbs SeaWater (GSW) Oceanographic Toolbox of TEOS-10 version 3.0 (Fortran)

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salinity and temperature conversions

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

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_specvol	- specific volume
gsw_specvol_anom	- specific volume anomaly
gsw_sound_speed	- sound speed
gsw_internal_energy	- internal energy
gsw_enthalpy	- enthalpy
gsw_dynamic_enthalpy	- dynamic enthalpy

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

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_entropy_t_exact	- entropy
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_delta_sa_ref	- Absolute Salinity Anomaly ref. 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_zerop	- entropy_part evaluated at 0 dbar
gsw_gibbs_pt0_pt0	- gibbs(0,2,0,SA,t,0)

## **File 2** gsw\_data\_v3\_0.dat

Contains the global data set of Absolute Salinity Anomaly Ratio  $R^\delta$ , and the global data set of Absolute Salinity Anomaly ref.  $\delta S_A^{ref}$ .

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/>