3.15 Stability ratio

The stability ratio R_ρ is the ratio of the vertical contribution from Conservative Temperature to that from Absolute Salinity to the static stability N^2 of the water column. From (3.10.1) above we find

$$R_\rho = \frac{\alpha^\Theta \Theta_z}{\beta^\Theta (S_A)_z} \approx \frac{\alpha^\theta \theta_z}{\beta^\theta (S_A)_z}. \tag{3.15.1}$$

3.16 Turner angle

The Turner angle Tu, named after J. Stewart Turner, is defined as the four-quadrant arctangent (Ruddick (1983) and McDougall *et al.* (1988), particularly their Figure 1)

$$\begin{aligned} Tu &= \tan^{-1}\left(\alpha^\Theta \Theta_z + \beta^\Theta (S_A)_z,\ \alpha^\Theta \Theta_z - \beta^\Theta (S_A)_z\right) \\ &\approx \tan^{-1}\left(\alpha^\theta \theta_z + \beta^\theta (S_A)_z,\ \alpha^\theta \theta_z - \beta^\theta (S_A)_z\right) \end{aligned} \tag{3.16.1}$$

where the first of the two arguments of the arctangent function is the "y"-argument and the second one the "x"-argument, this being the common order of these arguments in Fortran and Matlab. The Turner angle Tu is quoted in degrees of rotation. Turner angles between 45° and 90° represent the "salt-finger" regime of double-diffusive convection, with the strongest activity near 90°. Turner angles between −45° and −90° represent the "diffusive" regime of double-diffusive convection, with the strongest activity near −90°. Turner angles between −45° and 45° represent regions where the stratification is stably stratified in both Θ and S_A. Turner angles greater than 90° or less than −90° characterize a statically unstable water column in which $N^2 < 0$. As a check on the calculation of the Turner angle, note that $R_\rho = -\tan(Tu + 45°)$. The Turner angle and the stability ratio are avaialble in the GSW software library from the function **gsw_Turner_Rsubrho_CT25**.