APPENDIX

1.
Seawater density ρ can be expressed as a function of salinity s (psu), water temperature t (°C) and pressure p (bar) as follows.

$$\rho(s,t,p) = \frac{\rho(s,t,0)}{1 - p/K(s,t,p)}$$

$\rho(s, t, 0)$ is a density at $p = 0$ and expressed as follow.

$$
\begin{aligned}
\rho\ (s,t,o) =\ & \\
& +999.842\,594 && +6.793\,952\times10^{-2}\times T \\
& -9.095\,290\times10^{-3}\times T^2 && +1.001\,685\times10^{-4}\times T^3 \\
& -1.120\,083\times10^{-6}\times T^4 && +6.536\,332\times10^{-9}\times T^5 \\
& +8.244\,93\times10^{-1}\times S && -4.089\,9\times10^{-3}\times T\times S \\
& +7.643\,8\times10^{-5}\times T^2\times S && -8.246\,7\times10^{-7}\times T^3\times S \\
& +5.387\,5\times10^{-9}\times T^4\times S && -5.724\,66\times10^{-3}\times S^{3/2} \\
& +1.022\,7\times10^{-4}\times T\times S^{3/2} && -1.654\,6\times10^{-6}\times T^2\times S^{3/2} \\
& +4.831\,4\times10^{-4}\times S^2 &&
\end{aligned}
$$

$$
\begin{aligned}
K\ (s,t,p) =\ & \\
& +19\,652.21 && \\
& +148.420\,6\times T && -2.327\,105\times T^2 \\
& +1.360\,477\times10^{-2}\times T^3 && -5.155\,288\times10^{-5}\times T^4 \\
& +3.239\,908\times p && +1.437\,13\times10^{-3}\times T\times p \\
& +1.160\,92\times10^{-4}\times T^2\times p && -5.779\,05\times10^{-7}\times T^3\times p \\
& +8.509\,35\times10^{-5}\times p^2 && -6.122\,93\times10^{-6}\times T\times p^2 \\
& +5.278\,7\times10^{-8}\times T^2\times p^2 && \\
& +54.674\,6\times S && -0.603\,459\times T\times S \\
& +1.099\,87\times10^{-2}\times T^2\times S && -6.167\,0\times10^{-5}\times T^3\times S \\
& +7.944\times10^{-2}\times S^{3/2} && +1.648\,3\times10^{-2}\times T\times S^{3/2} \\
& -5.300\,9\times10^{-4}\times T^2\times S^{3/2} && +2.283\,8\times10^{-3}\times p\times S \\
& -1.098\,1\times10^{-5}\times T\times p\times S && -1.607\,8\times10^{-6}\times T^2\times p\times S \\
& +1.910\,75\times10^{-4}\times p\times S^{3/2} && -9.934\,8\times10^{-7}\times p^2\times S \\
& +2.081\,6\times10^{-8}\times T\times p^2\times S && +9.169\,7\times10^{-10}\times T^2\times p^2\times S
\end{aligned}
$$

2.
Potential water temperature θ can be expressed as a function of salinity S (psu), water temperature t (°C) and pressure p (bar) as follow.

$$\begin{aligned}\theta(S,t,p) = {} & t - p\,(3.6504\times10^{-4} + 8.3198\times10^{-5}t - 5.4065\times10^{-7}t^2 \\ & + 4.0274\times10^{-9}t^3) - p\,(S-35)\,(1.7439\times10^{-5} \\ & - 2.9778\times10^{-7}t) - p^2\,(8.9309\times10^{-7} - 3.1628\times10^{-8}t \\ & + 2.1987\times10^{-10}t^2) + 4.1057\times10^{-9}\,(S-35)\,p^2 \\ & - p^3\,(-1.6056\times10^{-10} + 5.0484\times10^{-12}t)\end{aligned}$$