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Conversion of Pressure to Depth

Sea-Bird's SEASOFT software can calculate and output depth, if the instrument data includes pressure. Additionally, some Sea-Bird instruments (such as the SBE 37-SI or SBE 50) can be set up by the user to internally calculate depth, and to output depth along with the measured parameters.

Sea-Bird uses the following algorithms for calculating depth:

Fresh Water Applications

Because most fresh water applications are shallow, and high precision in depth not too critical, Sea-Bird software uses a very simple approximation to calculate depth:

$$\text{depth (meters)} = \text{pressure (decibars)} * 1.019716$$

Seawater Applications

Sea-Bird uses the formula in UNESCO Technical Papers in Marine Science No. 44. This is an empirical formula that takes compressibility (that is, density) into account. An ocean water column at 0 °C (t = 0) and 35 PSU (s = 35) is assumed.

The gravity variation with latitude and pressure is computed as:

$$g \, (m/sec^2) = 9.780318 * [\, 1.0 + (\, 5.2788 \times 10^{-3} + 2.36 \times 10^{-5} * x) * x \,] + 1.092 \times 10^{-6} * p$$

where
$x = [\sin (\text{latitude} / 57.29578) \,]^{2}$
$p = \text{pressure (decibars)}$

Then, depth is calculated from pressure:

$$\text{depth (meters)} = [(((-1.82 \times 10^{-15} * p + 2.279 \times 10^{-10} \,) * p - 2.2512 \times 10^{-5} \,) * p + 9.72659) * p] / g$$

where
$p = \text{pressure (decibars)}$
$g = \text{gravity} \, (m/sec^2)$