# Deep SBE Data

From PA006-present and KE010-present, an SBE37S has been mounted on the acoustic release near the anchor. Retrieval rates have been high, and several years of data at each site are now available.

A variant on the standard salinity processing method was developed for the deep SBE data. Differences include handling of calibrations, computations at reference pressures, and corrections for early-deployment drift.

Due to the homogenous nature of the deep ocean, slight calibration differences can overwhelm the natural variability in the measurements. Discontinuities from year-to-year were noticeably greater than the range of measurements in any given year. To reduce the variability in the spread of calibrations, an average of the pre-calibrated and post-calibrated temperature, conductivity, and pressure values is computed and used as a starting point for quality control.

Salinity, along with potential temperature (**θ**) and density (**ρ**) adjusted to the nearest 1000 dbar-reference pressure, were calculated using well-documented equations (Fofonoff and Millard, 1983). Any discontinuity in potential temperature hinted at errors in temperature or pressure. Offsets less than the thermistor error (+/- 0.002°C) were applied to the temperature values to form a continuous potential temperature time-series, because potential temperature is more sensitive to temperature than pressure.

Although pressure differences of 10-50m have been observed in the deep SBE data due to terrain and/or mooring dynamics, density and salinity are expected to be consistent between deployments, especially in density adjusted for pressure (**σ4000**, **σ6000**). To blend the salinity and density across deployments, offsets less than or equal to the instrument error (+/-0.003 mS/cm) are added to the conductivity time-series. Several deployments are examined at once in an attempt to minimize the offsets required to form a continuous time-series.

Two issues unique to the deep SBEs are seafloor contact and early-deployment drift. Seafloor contact is suspected when sharp salinity discontinuities are associated with dips in pressure. When the data becomes affected by sediment or seafloor contact damage, the data are assigned Q5 (failed). The second issue, early-deployment drift, is seen as a curved artifact in the initial salinity data. Usually observed on the older, pumped version of the SBE37, it is thought to be a film of biocide getting into the conductivity cell, which erodes away with time (Wong et al. 2003). A secondary theory is accumulating sediment in the pump, which is backed up by physical evidence upon recovery. For quality control, a quadratic function is fit to the artifact in the salinity data and the trend removed to bring the data in line with the rest of the deployment. Conductivities are then backed out, and Q3 (adjusted) flags are assigned to C/S/D). A standard 13-point Hanning filter generates hourly data, and a boxcar filter applied to the 10-minute data generates daily averages.

Fofonoff, N.P. and R.C. Millard Jr, 1983. Algorithms for the computation of fundamental properties of seawater. UNESCO Technical Papers in Marine Science, No. 44, 53 pp.

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Wong, A. P.S., G.C. Johnson, and W.B. Owens, 2003. Delayed-mode calibration of autonomous CTD profiling float salinity data by theta-S climatology. *J. Atmos. Oceanic Technol.,* 20, 308-318, doi: 10.1175/1520-0426(2003)020<0308:DMCOAC>2.0.CO;2.