

Water Sample Salinity Analysis

1. Sampling

Samples were taken from all unique depths on every CTD cast. The salinity samples were taken in 200ml medicine bottles. Each bottle was rinsed twice and filled to just below the neck, with the bottle screw cap also being rinsed in the water from the Niskin bottle. The sample bottles' rims were then wiped with blue tissue paper and the bottles fitted with a plastic seal insert and capped with the (wiped/dried) screw cap. After each cast, the crate of salinity bottles was moved into the controlled temperature (CT) lab and left for 24 hours to equilibrate to the ambient temperature of the laboratory.

Samples were also taken from the underway system between every station using the same method as described above for the CTD. This was done to enable calibration of the Thermosalinograph (TSG) system. The underway samples were stored together in a separate crate and analysed once the crate had been filled, but were otherwise treated in the same way as the CTD samples.

2. Laboratory Setup

The salinometer used to analyse samples on JC031 was a Guildline 8400B Autosol, serial number 68426. On 12th February both heater lamps were replaced after it was noticed that the salinometer appeared to have experienced a notable temperature drop and was constantly heating the water bath. This was found to be due to one of the heater lamps having blown, and both were therefore replaced as a precaution. Aside from this, no major technical problems were experienced with the instrument.

The salinometer was set up in the constant temperature laboratory, with the lab temperature set at 22°C and the salinometer water bath temperature set at 24°C throughout the cruise. A thermometer kept next to the salinometer was used to record lab temperature whenever an analysis was performed, and the temperature was in the range of 22-23°C throughout the cruise. Ocean Scientific Instruments Ltd (OSIL) standard seawater batch P150 (conductivity 0.99978) was used for standardisation throughout.

3. Analysis

In total, 1612 samples were analysed. The crates were analysed in batches of two or more. At the beginning of each crate, the salinometer was standardised using OSIL P150 standard seawater and the potentiometer setting was noted. The P150 standard seawater was then measured (as a sample) following standardisation. At the end of the crate (when another crate was available to be analysed immediately afterwards), the P150 standard seawater to be used for standardising the next crate was also measured as the final sample of the prior crate. For example, for crates 1 and 2, where crate 1 contains 24 samples: readings number 1 and 26 for crate 1 would be measurements of the standard seawater, the seawater used for reading 26 would then be used to standardise the salinometer prior

to the analysis of crate 2, and would finally be measured again as reading number 1 of crate 2. This enabled an extra stage of error checking of the salinometer measurements to be performed, showing offset at beginning and end and hence any drift. In addition to this, the salinometer data logging software (supplied by OSIL and used to record measurements throughout the cruise) applied the offset measured during the standardisation procedure to all readings. Further corrections were applied to readings where the initial/final values appeared to have shown significant drift, with the difference between the final and expected value being subtracted, where this was available, as it was noticed that the salinometer was generally more stable towards the end of an analysis. Stations to which corrections were applied were: 14, 17, 38, 39, 57, 64, and 65. Further details are given in Table 1 below. Bottles were removed from Stations 23, 45 and 60 due to suspected bad data quality. Further details are given in Table 2.

Table 1: Adjustments applied to station values

Station number	Correction
14	-0.0019
17	0.003
38	0.0045
39	0.001
57	0.0013
64	-0.001
65	-0.0018

Table 2: Bottles removed due to suspected bad data quality

Station number	Bottle removed
23	18
45	1
60	1

4. Processing

Salinity values were obtained by following standard procedure of using the conductivity ratios obtained from the Autosal analysis of the samples. The conductivity ratios are automatically recorded in Excel files which correct for offsets from standard readings.

5. Assessment

The 8400B Autosal was found to be a reliable piece of equipment despite requiring a certain degree of troubleshooting, in order to return the instrument to full working order. Therefore it can be stated that although this is a very useful and accurate piece of equipment, it is not foolproof and its performance requires close observation in order to identify when the accuracy is beginning to fail.