HOT - BATS Salinity Intercomparison

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A summary of duplicate salinity measurements made by members of BATS and HOT.

In October 1995, 17 salinity samples were sent from Bermuda to Hawaii. These samples were duplicate samples taken from the BATS project and were sent to HOT to provide a salinity intercomparison. Becky Little acted as the BATS representative for this endeavor.

Craig Nosse measured the BATS duplicate salinity samples during the routine measurements of the HOT-67 salinity samples on November 5, 1995. After the salinities were processed, the data were sent out to Becky Little via email. And, in return, she emailed the salinity data she came up with for her measurement run.

The mean difference between the HOT - BATS duplicate salinity samples (with one outlier removed) was 0.0013 psu (Figure 1). The standard deviation was 0.0016 psu. Almost all (14 out of 16) of the samples measured by HOT were measured as saltier compared to the BATS measurements. It is of course important to try and determine why this was the case.

Salinity samples are known to get saltier, due to evaporation, when left for a long period of time in plastic bottles. However, these salinity samples came from BATS in sealed, glass bottles and were measured less than one month after they were obtained at sea. So, evaporation would not seem to be a cause of the difference in the measurements.

IAPSO batch p127 (conductivity ratio of 1.99980) was used by BATS to insure the proper measurements of their samples. Three measurements of batch p127 were made by BATS and their readings were 1.99980, 1.99982 and 1.99983. Hence, there does not seem to be a large drift which could explain the offset in the measurements. And, if anything, the BATS machine appears that it may have drifted slightly saltier anyways.
IAPSO batch p123 (conductivity ratio of 1.99988) was used by HOT to maintain proper measurements of the sample. Three IAPSO measurements were made and the readings were 1.99988, 1.99988 and 1.99992. The last IAPSO measurement is suggestive of Autosal drift but 18 substandards taken during the course of the measurements did not show any obvious drift.

Since it seems that neither a BATS nor a HOT Autosal drift can explain the offset in the salinity measurements, it is important to think about the nature of the IAPSO’s themselves. It is known that salinities from IAPSO batches could be off by 1 mpsu. In some sense, we sometimes have greater confidence in our substandards than an IAPSO batch. So, the 0.0013 psu difference between the HOT and BAT samples could be explained by inconsistent IAPSO batches.

It would be great to see if in the past, BATS and HOT had received and measured separate shipments of IAPSO batch p123 or p127. If such an incident had happened, the two projects could share their experiences with the respective batch. This would help to determine if the offset seen in the duplicate measurements could be due to an inconsistent IAPSO batch. Unfortunately, such a comparison isn’t possible as HOT has not measured batch p127 and BATS does not have a measurement of p123 on record.

So, it appears as if the 0.0013 psu difference may never be resolved. However, it is encouraging that the difference is small. Especially when it is considered that Autosals are only accurate to about 0.001 psu.
Measurements

Salinity Difference (psu)

HOT – BATS Salinity Intercomparison (One Outlier Removed)

Mean=0.0013

STD=0.0016