Processing Arabian Sea MOCNESS Oxygen Data

The equation used at sea to produce oxygen values for the Arabian Sea MOCNESS oxygen probe produced negative values at low oxygen values. Shipboard calibration of the probe for low oxygen values should have been conducted to adjust the constants in the equation. Faced with after-the-cruise calibration, a great deal of experimentation with approaches(see Approaches to the Recalibration Problem) led to the following technique.

For the depths of 150m(except as noted) to the deepest MOCNESS value, or 1100m(whichever was shallower), all available winkler oxygen values for a station were collected, from Codospoti's data on the JGOFS website. They were averaged across 2m intervals. The same depth MOCNESS values for that station were also determined. All of these values were handpicked, the Winklers from the data available on the JGOFS database, MOCNESS from the .PRO files, except for Cruise 1, TN043. For that cruise, the .PRO files have negative oxygen values set equal to zero. A MATLAB function was created to calculate negative oxygen values from the raw data- oxycurrent, oxytemp, pressure and salinity(see oxcalc.m).

Note - There is only one case where the MOCNESS sensor was sent down with the CTD, in all other cases the Winkler data is from CTD casts, and separated in time and space from the MOCNESS tows. Winkler data was pooled and averaged for each station, as was MOCNESS data.

A spreadsheet was created in EXCEL 5 containing the Winkler depths and oxygens and the matching MOCNESS oxygens. A linear depth correction was addedto each MOCNESS value. The winkler values(y) were graphed versus the MOCNESS values(x) using CA-Cricket Graph III, and a linear fit established.

Back in EXCEL, the linear fit equation was applied to the (MOCNESS oxygen value+depth factor). These values were then graphed in EXCEL to create an oxygen profile.

The depth correction factor was established after the observation that there seemed to be a depth relationship between the MOCNESS values and the Winkler values. The depth divided by some number was a way of adding a depth factor, and experimentation led to the appropriate one for each cruise. The established values are 8,000 for TN043, and 6,000 for TN045, TN050, TN054.

In a few cases, noted, the MOCNESS and Winkler values diverge between 150-200m. In those cases, the fits were made for the depths of 200m down. Also, a few MOC tows did not seem to match each other or the available winkler data, those tows were also not included in the pooled data.

Steps involved:

1)Handpick Winkler and MOCNESS data, enter in EXCEL spreadsheet. Use values from 150-depth or 1100m(whichever is shallower.)

2)Use CA-Cricket Graph III to graph winkler(y) vs [mocness+depth/constant](x), and apply a linear fit.

3) Import .PRO file into EXCEL. Use above linear fit equation on all MOCNESS [data+depth/constant] for appropriate depths, and graph profile.

Caveat - Accurate to +/- 0.03 ml/l(Winkler Accuracy)