# CTD Data Collected on Okeanos Explorer Cruise EX1004 Leg 3 Worksheet

These data are from a CTD cast made aboard the Okeanos Explorer on July 24, 2010, as part of the INDEX-SATAL 2010 Expedition.

CTD Data

| Depth (m) | Temperature (°C) | Salinity (psu)* | Density ($g/cm^3$) |
|---|---|---|---|
| 20 | 29.5 | 34.15 | _____ |
| 40 | 28.5 | 34.24 | _____ |
| 60 | 28.5 | 34.25 | _____ |
| 80 | 27.0 | 34.35 | _____ |
| 100 | 25.5 | 34.45 | _____ |
| 125 | 24.0 | 34.60 | _____ |
| 150 | 23.5 | 34.76 | _____ |
| 175 | 18.0 | 34.65 | _____ |
| 200 | 16.5 | 34.60 | _____ |
| 220 | 15.0 | 34.54 | _____ |
| 320 | 11.5 | 34.40 | _____ |
| 420 | 10.0 | 34.46 | _____ |
| 520 | 8.0 | 34.55 | _____ |
| 620 | 7.0 | 34.52 | _____ |
| 720 | 6.0 | 34.53 | _____ |
| 820 | 5.5 | 34.56 | _____ |
| 920 | 5.0 | 34.54 | _____ |
| 1050 | 4.5 | 34.55 | _____ |
| 1150 | 4.5 | 34.56 | _____ |
| 1250 | 4.5 | 34.57 | _____ |
| 1350 | 4.0 | 34.57 | _____ |
| 1450 | 4.0 | 34.58 | _____ |
| 1550 | 4.0 | 34.58 | _____ |
| 1650 | 4.0 | 34.58 | _____ |
| 1750 | 4.0 | 34.58 | _____ |
| 1800 | 4.0 | 34.59 | _____ |

* Salinity is measured by conductivity (how easily electricity flows through a seawater sample). The software used to process conductivity data from the Okeanos Explorer CTD converts the conductivity measurement to salinity values in practical salinity units (psu). Before psu was adopted as a standard unit, salinity was measured in parts-per-thousand (abbreviated ppt or o/oo), and you still may see references to these units, which are almost the same as psu.

1. Make a graph of salinity and depth. Put depth on the Y-axis of each graph, and put zero at the TOP of the Y-axis. Oceanographers like to plot CTD data with depth on the y-axis and the greatest depths at the bottom of the plot, since that is the way we usually think about a profile of the water column.

2. Make a graph of temperature and depth, with depth on the Y-axis as in Step 1.

3. Use an online calculator to find the density of seawater at each depth. These calculators require you to enter values of pressure as well as temperature and salinity. Pressure in the ocean (in bars) is nearly equal to the depth in meters divided by 10 (in other words, for every 1 m increase in depth, pressure increases 0.1 bar). Pressure at the ocean surface (depth = 0 m) is equal to 1 bar, so pressure underwater is equal to

   [(depth in meters) ÷ 10] + 1.0

4. Where did density change most rapidly?

5. In general, what happens to density as depth increases?

6. How do changes in density with increasing depth differ from changes in temperature and salinity with increasing depth?

7. If an underwater robot is neutrally buoyant (that is, it does not rise or sink in the water column) at a certain depth, what will happen if the robot enters a water mass that has a lower density?

8. What will happen if the water mass has a greater density?

http://www.csgnetwork.com/water_density_calculator.html