SIO 210 CSP Problem Set 1
October 3, 2016
Due October 17, 2016 (2 weeks)

If you work together on these, please make sure that you understand the concepts and use your group discussion to help with the understanding.

1. (a) Explain briefly the usefulness of the non-dimensional parameter 'aspect ratio'.

For the following, estimate the Rossby number
(b) Tsunami
(c) Diurnal tide
(d) Global overturning circulation
(e) Bubbles

2. Use the Mindanao Trench temperature and potential temperature graphical comparison from class (properties of seawater second lecture) and the textbook:

(a) Estimate from the graph the temperature and potential temperature at 5000 m depth, and the difference between them.

(b) Use this estimated value of potential temperature and calculate the heat content if this value is correct for a layer that is 1000 m thick and over a region that is 10,000km x 5,000 km. For density, look at other graphs or vertical sections online and estimate the density. Use a specific heat of c_p = 3850 J/kg °C. Express your answer in Joules.

(c) Calculate the difference between your heat content and a heat content that would be calculated from the temperature. Express your answer in Joules.

3. Find any ocean SST animation online (suggestion – look at NASA or NOAA animation websites), list your source, and
(a) Describe the overall structure.
(b) Pick one local feature and describe how it evolves with time.

4. Find any ocean SST anomaly animation online (same as 3 but different quantity), list your source, and
(a) Explain what an anomaly is. How was it calculated for the animation you found (look for the information on the website)? If they don't list it, prepare to write a letter to the "contact us" line!
(b) Describe the overall structure of the field that you find. If the website is related to a particular climate phenomenon, such as ENSO, describe what you see that is relevant to that phenomenon. (You do not need to learn all about the climate phenomenon – we will do this later. Please just describe what you see.)

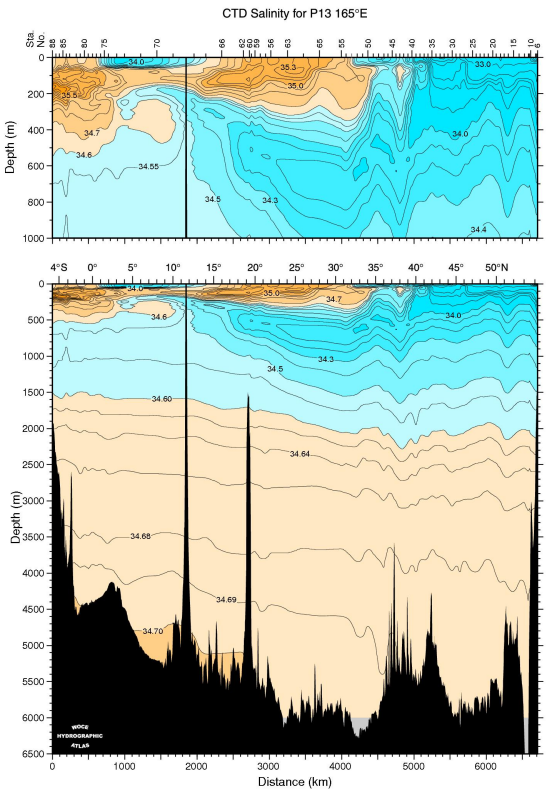
5. A computer file that is a time series of water temperature at the end of the Scripps pier is now linked on the course website.

   SIO pier data are found on several sites. Data set provided here is in csv (ascii) format, easy to use with excel and other programs. I retrieved it from: http://www.sccoos.org/data/manualshorestations/?study=SIO%20Pier%20Shore%20Station

   Another way in to the SIO pier data sets is here, with lots of plots available, but data not easily accessed: http://sccoos.ucsd.edu/data/piers/

   Use this file and compute the mean, the variance, and the standard deviation of the temperature. If you have plotting capability (excel, matlab, R, python, etc), plot the time series and then plot its anomaly relative to the record mean (i.e. the mean value over the entire record).

6. (a) On the attached vertical section, from the Pacific Ocean at 160°E, find at least one location that has a strong halocline. What is a halocline?



(b)Go online to find this section (in http://woceatlas.ucsd.edu - follow links until you find it.)

Find the potential density section. Identify the pycnocline that goes with this (these) haloclines.

(c) Find the potential temperature section. Describe the vertical potential temperature structure that goes with the halocline(s).

(d) Back on the salinity section above: identify the Subtropical Underwater and explain what created it.

(e) Locate the low salinity intermediate water on this section (it's called North Pacific Intermediate Water). Explain why there is a salinity minimum.