

## Problems Week 2

*Due Thursday, October 12, 2017*

As we've noted in class, data sets have been collected at the end of the pier for 101 years. Melissa Carter, the Shore Stations Program Manager, has posed a question about the relative value of automated measurements compared with manual stations. Choose either the salinity or temperature records from the pier. The automated data are available for download here:

<http://sccoos.org/thredds/catalog/autoss/catalog.html>,

The manual data are here for temperature:

[ftp://ftp.iod.ucsd.edu/shore/active\\_data/lajolla\\_sio/temperature/](ftp://ftp.iod.ucsd.edu/shore/active_data/lajolla_sio/temperature/)

and here for salinity:

[ftp://ftp.iod.ucsd.edu/shore/active\\_data/lajolla\\_sio/salinity/](ftp://ftp.iod.ucsd.edu/shore/active_data/lajolla_sio/salinity/)

1. **Visual evaluation.** Plot the two records. Are there obvious discrepancies between them? What time of day are the samples collected? What years are covered?
2. **Means.** Evaluate whether the mean temperature or salinity is consistent within error bars.
3. **Variance.** Evaluate whether the variance or standard deviations are consistent. Do you obtain different results if you subsampled the automated data at the times of manual measurements, or if you use all of the automated data?
4. **Theoretical pdfs.** For the automated data, given the observed mean and variance, what would the pdfs look like if the data were drawn from (a) a Gaussian distribution, (b) a uniform distribution, or (c) a bimodal (coin-toss) distribution? You can do this analytically or numerically (e.g. using Matlab). Bonus points if you can show both methods.
5. **Empirical probability density functions.** Plot the pdfs for the automated and manual records.
6. **Compare pdfs.** Evaluate (quantitatively) whether the observed pdfs are comparable within error bars.
7. **Summary.** On the basis of your evaluations, what is your assessment of the value of the manual data relative to the continuous data?

As we'll see on the pier tour, there are some subtleties to the pier data sets, particularly for the automated conductivity sensor (which is used to derive salinity). Standards for maintaining the automated system have improved since 2012.