

## Problems # 9: Spectra and coherence

*Preliminary work due Thursday, December 7, 2017; Final write up and presentation due in final exam, Wednesday, December 13, 2017, 11:30-2:30.*

1. **Spectra (20 points).** Choose a pair of time series (or spatial records.) Plot the time series. Compute an estimate of the frequency (or wavenumber) spectrum for each of the data records. Describe the major characteristics of the spectra. Be sure to show your uncertainty estimate.
2. **Coherence (20 points).** Now compute the coherence between the two records. Are the two records statistically coherent? What is the phase relationship between the two records?
3. **Bonus (optional, up to 10 points).** Can you say anything further about the data?
4. **Presentation (10 points).** Share your data and conclusions with your classmates.

Some comments about this assignment:

- You may choose any ocean or atmosphere data that you like. This could be data that you have looked at for research, or something that your current advisor suggests, or data that you simply pull from the internet. If you have doubts, please come talk to me.
- This exercise will make more sense if you choose data records that could plausibly have a physical connection: e.g. wind and upper ocean temperature, temperature at two different depths, air temperature and ocean temperature.)
- Some candidate data sets include (a) data from the Scripps pier, perhaps including some of the variables that we examined at the start of this quarter, (b) mooring data from the TAO, RAMA, or PIRATA arrays, (c) satellite or model fields. If you aren't sure what to do, please come talk to me.
- The assignment comes in two parts. For Thursday, December 7, please make a first pass at your analysis. This should be completed on your own, without collaborating with your classmates—probably not a big deal, since you should choose different data sets. I will provide feedback on this, and you can submit an update at the time of the final exam. The update should also not be collaborative.
- For the final exam time slot, on Wednesday, December 13, please prepare short a 5-10 minute presentation to share your data and interpretation with your classmates. Your presentation should explain the data that you chose, what you hypothesized you might find, and what your results show. You may talk to your classmates about the logistics of assembling an oral presentation.