Lecture 26 – Planning Cruises

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* “People never seem to find the time to do things right, but they always find the time to do things over”
* Cruises can cost $25,000/day
* Things we’ve learned:
  + Note taking is crucial. Record everything, especially times
  + Make sure you’re taking adequate water samples for everything you need to validate
  + Make sure you look at the data in real time. Is there a problem with your sensor/instrument? Is the data actually logging to the file? Is the file actually saving to the directory?
  + Prepare as much of your processing scripts ahead of time as possible (ie, do some tests with your instruments so you know the format of the files coming out them. Prepare your processing scripts ahead of time so that you can get right to the data analysis).
  + If you have to choose between getting less data that’s guaranteed to be correct and more data that might be wrong, choose the former
  + Choose an appropriate sampling frequency. You need to research ahead of time, as much as possible, the natural frequency of what you’re trying to measure.
    - High frequency over a short time with temporal gaps. Called “burst sampling”.
    - Lower frequency but constant sampling.
    - You can do a decorrelation function. This requires an initial high-frequency of sampling. Then you look at how long you can wait between samples (either in time or space) before the data drops below a certain threshold of correlation
      * Ex/ Water masses 1km are identical, 5km apart are 50% different and 10km apart are completely different. Maybe don’t waste money sampling every 1km, but also don’t sample at 10km because you could be missing patterns.
  + Sample multiple times. Data with no replicates are not reliable statistically. Also sometimes the instrument doesn’t work/the data is corrupted. You want redundancy for when casts fail.
  + Have protocols on hand for when you get tired/sick and can’t remember everything off the top of your head.
  + Have clearly defined objectives ahead of time. If you know you’re going to be interested in chlorophyll fluorescence, maybe you should bring a fluorometer.
    - A good way to do this might be to do a dry run in Hydrolight ahead of time. You may find that model what you actually wanted, you need a specific input you hadn’t considered and weren’t originally planning to measure.
  + “Think beyond your immediate problem”. If you limit your data collection, you won’t be able to investigate any other problems in the future (whether it’s investigated by you or someone else). Measure as many things as possible while you’re out there.
    - Ie, always keep the idea of collaboration in mind. You may be able to better explain your data by bringing in an expert of a method you’re not familiar with, but that expert is going to have to use different variables than what you’re focusing on.
  + Even after setting well-defined goals, make sure those goals are flexible. You may set out with Objective A, but be prepared to adapt as things fail or (more ideally) unexpected opportunities arise (say, an unexpected bloom or eddy you get the opportunity to sample).
  + Sensors
    - Redundancy in instrumentation, measuring the same variables (when possible), for two reasons:
      * Can you really trust measurements from a single instrument – what if it’s reading wrong values? Closure is very helpful. Having multiple instruments measuring the same thing also allows you to estimate the error in your measurement of that variable.
      * What happens if one instrument fails mechanically while at sea? You don’t want your whole sampling schedule ruined.
    - Calibrate your sensors before and after every cruise. If you have a bias, you want to be able to correct for it
    - Validate your sensors (ie, check for closure of your final products with estimates of the same product from other methods).
    - Do proper dark counts and blanks. Definitely make sure your blank is appropriate to what you’re doing (ie, don’t use a distilled freshwater blank if you’re going to be measuring sea water samples. Maybe take an extra sea water sample and filter it, then use that as a blank).
  + If possible, periodically backup your data while on a cruise. If a hard drive fails, you don’t want to lose all your data (bring an external hard drive; backup at the end of every day?)
* Tips for Post-Cruise Data Handling:
  + Set a data policy in advance
    - Who will have access to it, how soon will people have access to it, do other people have permission to use it for publication or only for private use, etc
    - Make sure to document the current state of the data when you finally do share it. Is it in a form acceptable for general use? (ie, all corrections are done, QC has been run, etc)
      * A good way to do this is to document each file with a “release version” annotation. Maybe keep a meta document with a log of what changed between each release version.
  + Some journals publish whole data sets from cruises, as a collaborative effort with all the researchers on that cruise.
    - Nothing particularly science-y is done with it, it’s just a way of getting the data out there and letting people know where it is.
    - It also allows for proper citation of a data’s source, for anyone who uses your data later. They can acknowledge your work done for data collection.
    - Example journal: ESSD (Earth System Science Data)