

SOP 14: Annual Data Report (OC_K Creation)

Version 1

Revision History Log:

Prev. Version #	Revision Date	Author	Changes Made	New Version #
[none]	Oct. 2010	S. Danielson, W. Johnson, L. Sharman, G. Eckert, B. Moynahan	Initial version	1

The annual report will summarize the field efforts of the previous sampling year, provide graphical and tabular summaries of collected data and place these data within historical context so that unusual observations can be identified. The sampling year ends after the October cruise, so the final certified data will not be available until after the instrument returns from the Sea-Bird calibration facility, typically in November or early December. The December oceanographic cruise will take place in December or January; the Annual Data Report will normally be generated in January or February.

Because water column samples of phytoplankton, suspended sediment, and dissolved oxygen are not taken and analyzed, the ancillary data sensors cannot be quantitatively compared on an inter-cruise or inter-annual basis, nor even within the same cruise (it is acceptable to compare measurements within the same cast, however). For example, different phytoplankton species have different responses as measured by the fluorometers. Consequently, even within a single cruise, data are not directly comparable because phytoplankton communities within a fjord near a glacier may well have different species compositions from communities more closely connected to the Gulf of Alaska. Similarly, field personnel have no way to calibrate the OBS sensor *in situ* to particle size distribution, shape, color, reflectivity, etc., so turbidity measurements among casts and cruises must be interpreted with considerable caution. Nonetheless, it is important to examine these data (on a relative scale) in order to note possible changes in the character of these parameters over time.

1.0 Annual Report Format and Content

The Annual Data Report will follow the NPS Natural Resource Data Series report format (<http://www.nature.nps.gov/publications/NRPM/index.cfm>) and will contain the following subsections and content:

1. **Introduction:** Overview of the monitoring program and its history; personnel involved.
2. **Methods:** Summary of the sampling methodology, timing of field work.
3. **Coverage:** Chart showing what stations were occupied in what months
4. **Synopsis of operations:** Overview of the year; what went well; what problems cropped up; what needs particular attention in the coming year. Summary of observation comments and notes recorded on the Field Log sheets.
5. **Results:**

- i. *Tables summarizing basic measurement and statistics.* Provide the mean, maximum, minimum and standard deviation (as appropriate) of designated parameters in the upper 50m of the water column from all cruises (for each core station). Parameters will include: temperature, salinity, density, vertical density gradient, fluorescence, oxygen, OBS and PAR. (See example in section 2.0 following.) A second table will depict water column conditions from near the bottom at each station.
 - ii. *Analysis of Station 04 with respect to historical data.* Vertical profile plots or tables of the temperature and salinity measurements from Station 04 in all cruises along with historical mean and +/- one standard deviation.
 - iii. *Horizontal cross-sections.* Horizontal cross-sections of temperature, salinity, density, fluorescence, oxygen, and OBS from the July and December/January cruises. For each of the cruises with cross-section plots, one set of cross-sections should show the data extending from Icy Strait to the head of the West Arm, and a second set should show the data from Icy Strait to the head of the East Arm fjord.
- 6. Discussion:** Summary of observations based on tables and figures presented in the Results section. Note in particular anomalous conditions that persist through multiple sampling periods, multiple years and/or across domains.

2.0 Content of Results Section (i): Tables Summarizing Basic Measurements and Associated Statistics

In order to assess the measurements made within each cruise, standard statistical summary tables (Table SOP 14.1) and/or plots will be created by the Project Leader with help from the Data Manager in accessing values stored within the database.

These tables will be useful to other researchers conducting marine related studies in the park. Such data tables can be incorporated directly into their analyses, and the Annual Data Report will provide sufficient context for interpretation of these measurements.

Rows of each table will describe each field effort conducted through the year and at each core station. Columns of the data tables will contain the 0–50m depth level mean, maximum, minimum and standard deviation for all of the following parameters: Temperature, Salinity, Density (Sigma- t), Vertical density gradient, Fluorescence, Oxygen, OBS, and PAR. Exceptions to the reported statistics are for 1) the density gradient parameter which requires reporting of the mean, maximum and depth of maximum only, and 2) the PAR measurement which requires the mean, minimum and maximum values only. For purposes of this report, vertical density gradient is calculated as $[(\text{density at next lower bin}) - (\text{density at next higher bin})] * 0.5$. The top and bottom depth bins of each cast have no vertical density gradient. Table SOP 14.1 shows example table setups for reporting these statistics.

The 0–50 m depth level captures the portion of the water column where the majority of primary production, macronutrient utilization, phytoplankton standing stock, thermal stratification, and low-salinity lenses all occur. Thus, summarizing this portion of the water column will provide a broad perspective on the physical, chemical and phytoplankton components of the system.

The near-bottom summary table will provide information about 1) bottom water renewal rates and timing within the fjord; 2) to the nutrient budget cycle dynamics; and 3) connectivity of the fjords with the outside waters.

Table SOP 14.1. Example data summary tables for reporting the basic measurement and statistics collected at the core station set.

GLBA Oceanography Core Stations 0-50m Annual Data Summary																	
Station	Year	Month	Temperature				Salinity				Density				Density Gradient		
			mean	min	max	std	mean	min	max	std	mean	min	max	std	mean	max	depth of max
01		Dec/Jan															
		Mar															
		Apr															
		May															
		Jun															
		Jul															
		Aug															
		Sep															
		Oct															
		Dec/Jan															
04		Mar															
		Apr															
		May															
		Jun															
		Jul															
		Aug															
		Sep															
		Oct															
		Dec/Jan															
		Mar															
07		Apr															
		May															
		Jun															
		Jul															
		Aug															
		Sep															
		Oct															
		Dec/Jan															
		Mar															
		Apr															

GLBA Oceanography Core Stations 0-50m Annual Data Summary																	
Station	Year	Month	Fluorescence				Oxygen				OBS				PAR		
			mean	min	max	std	mean	min	max	std	mean	min	max	std	mean	min	max
01		Dec/Jan															
		Mar															
		Apr															
		May															
		Jun															
		Jul															
		Aug															
		Sep															
		Oct															
		Dec/Jan															
04		Mar															
		Apr															
		May															
		Jun															
		Jul															
		Aug															
		Sep															
		Oct															
		Dec/Jan															
		Mar															
		Apr															

3.0 Content of Results Section (ii): Analysis of Station 04 with Respect to Historical Data

Using data from Station 04 only, vertical profiles (temperature vs. depth and salinity vs. depth) are to be plotted along with the climatologic mean profile in order to assess the relation of the current data to the long-term mean (Figure SOP 14.1). The data should also be tabulated so that the values shown in the plots are easily accessible to managers and other researchers (Table SOP 14.2). Station 04 is selected for this analysis because it represents a deep station inside the main sill of the fjord and with close connection (proximity) to the West Arm, East Arm and Lower Bay domains.

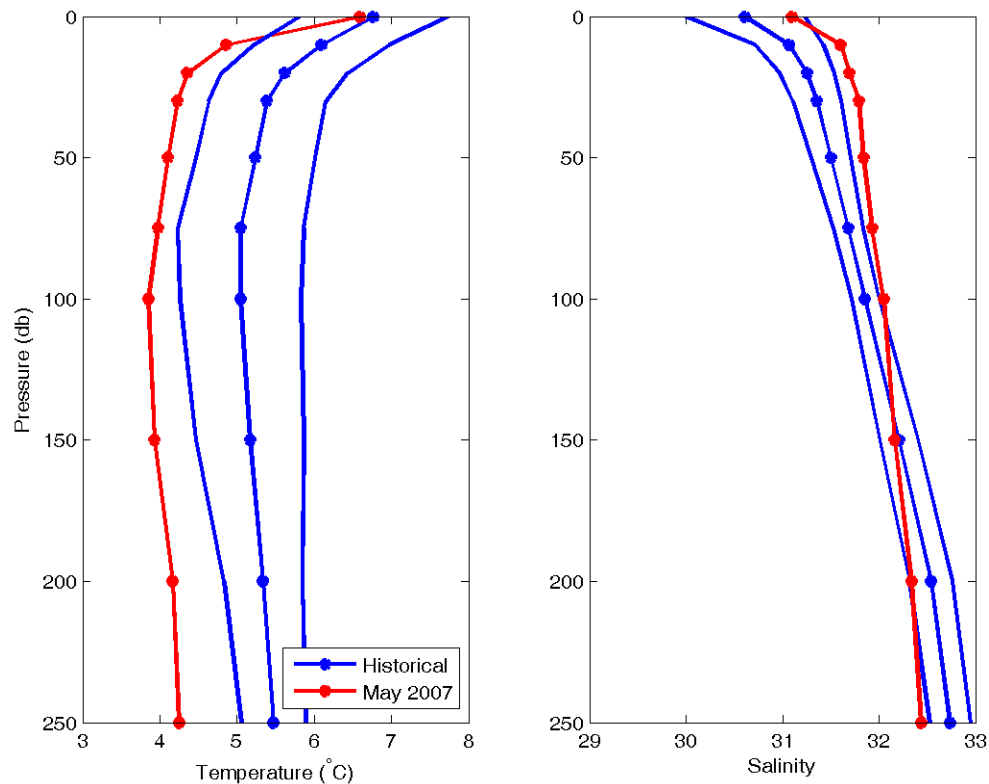


Figure SOP 14.1. Example vertical profiles of temperature (left) and salinity (right) shown along with historical data. Data is taken from oceanographic station GAK1 in the northern Gulf of Alaska near Resurrection Bay. Plotted are the current data (May 2007, red with dots) and historical mean values (blue, with dots) along with +/- bounds of 1 standard deviation to either side of the historical mean (blue, without dots). Only a subset of the full vertical profile has been employed here: the 0, 10, 20, 30, 50, 75, 100, 150, 200 and 250 m depth levels. From this plot, we see that waters in May 2007 are anomalously cold over nearly the whole water column whereas the waters are anomalously salty between 10 and 100 m depth and anomalously fresh at 250 m depth.

Error bounds of one standard deviation plotted to either side of the monthly climatology will allow the profile of interest to be assessed as to whether or not the monthly values' deviations (from the monthly climatology) are considered "normal" or "anomalous." An anomalous value is defined as one with observations that fall beyond one standard deviation of the mean of that month's measurements. Therefore, by definition of 1 standard deviation and the assumption of a normal distribution, 68% of all years will be considered "normal" and 32% will be considered "anomalous". Anomalous measurements are to be noted in the discussion section of the report. Observations that fall outside of two standard deviations (~95% of normally distributed observations) represent very unusual occurrences and deserve particular attention within the annual report.

Table SOP 14.2. Example data table: tabulation display of the same data presented in Figure SOP 14.1. To help draw attention to anomalous measurements, observations made in May 2007 that lie outside one standard deviation of the long-term mean are emphasized in bold, italic type.

Station GAK1 Temperature					Station GAK1 Salinity			
Depth (m)	1972–2008 May Mean	Mean - 1 Standard Deviation	May 2007	Mean + 1 Standard Deviation	1972–2008 May Mean	Mean - 1 Standard Deviation	May 2007	Mean + 1 Standard Deviation
0	6.69	5.66	6.59	7.72	30.63	30.02	31.10	31.24
10	6.03	5.10	4.86	6.95	31.08	30.73	31.60	31.43
20	5.56	4.73	4.36	6.40	31.25	30.98	31.69	31.53
30	5.35	4.58	4.23	6.12	31.36	31.11	31.79	31.60
50	5.20	4.42	4.10	5.98	31.49	31.29	31.84	31.70
75	5.01	4.18	3.97	5.83	31.67	31.52	31.93	31.83
100	5.01	4.23	3.85	5.80	31.85	31.71	32.05	31.99
150	5.15	4.46	3.93	5.84	32.20	32.00	32.16	32.40
200	5.33	4.82	4.17	5.83	32.54	32.32	32.34	32.76
250	5.46	5.05	4.25	5.87	32.75	32.53	32.44	32.96

These tables and vertical profile plots are to be generated at a select subset, the “standard oceanographic” depths: 0, 10, 20, 30, 40, 50, 75, 100, 150, 200, 250, 300, 400, and 500 m depth levels.

4.0 Content of Results Section (iii): Horizontal cross-sections

Horizontal cross-section plots can be generated with the Ocean Data View (ODV) software (<http://odv.awi.de/>). An ASCII data table provided by the Data Manager that contains the full “flattened” dataset can be imported directly into ODV. Parameters to plot include temperature, salinity, fluorescence, oxygen and OBS and should cover stations from Icy Strait to the head of West Arm. An example of a horizontal cross-section figure along Glacier Bay is presented in Figure SOP 14.2.

These figures provide a visual depiction of the data collected with the highest spatial resolution. Features within the figures will lend themselves to discussion of biophysical processes that are important to the marine ecosystem.

5.0 Validation and submission of the deliverable

The final version of OC_K is generated as a PDF file by the Project Leader. It is passed to the Data Manager for the defined validation checks and eventually is confirmed certified through the workflow used for all deliverable certifications. The Data Manager installs the final PDF in the auxiliary repository, creates a web link for it, updates the Deliverable Product Tracking grid, and forwards the final OC_K to NPS’s NRInfo Portal (formerly NPS Data Store).

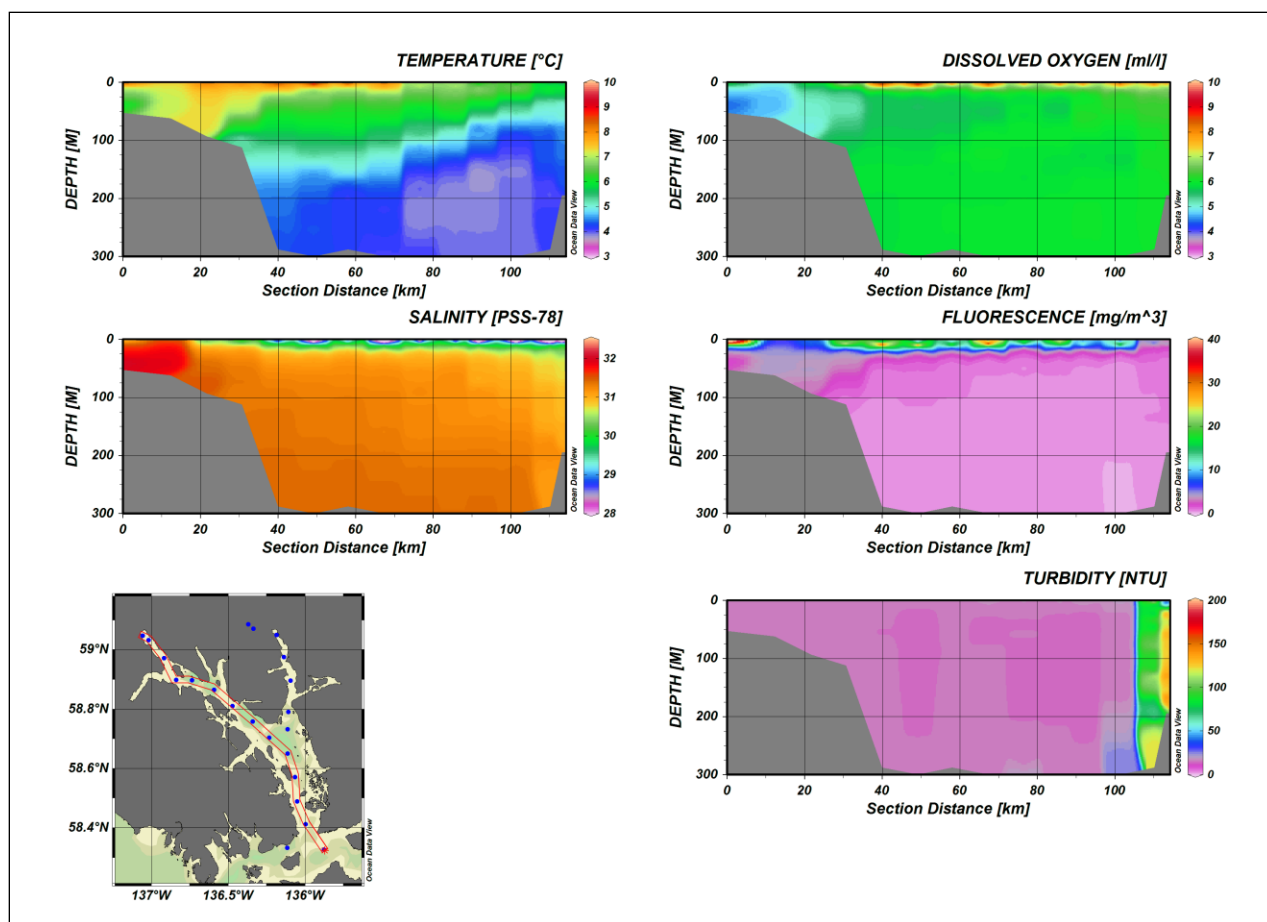


Figure SOP 14.2. Example ODV-generated cross-section contour plots using Glacier Bay CTD data collected in July 2009. Station locations are plotted with blue dots in the map in the lower left-hand corner, the transect is outlined in red. On the contour plots, the mouth of Glacier Bay (station 00) is located at 0 km on the horizontal axis.

