



Plotting Ocean Water Temperatures: Large Scale Sampling vs. Fine Scale Sampling



Introduction: Ocean water temperature is an important factor studied by the GLOBAL ocean ECosystems dynamics (GLOBEC) program. The Northeast Pacific program (NEP) studies the waters off of Oregon and the Gulf of Alaska. Several times each year research vessels make surveys of many ocean factors: salinity, water temperature, current speed and direction, phytoplankton, bird, mammal and fish populations and distribution, and water clarity. In addition to research vessels satellites are used to make daily measurements of surface water temperatures and phytoplankton abundance. All of these factors are influenced off Oregon by a combination of wind and weather patterns, topography continental shelf and ocean basin, and the influence of coastal rivers.

In this activity you will be able to learn about the different levels of detail that can be gathered by large and fine scale sampling of ocean temperatures. Ocean water temperatures were sampled along several different east-west running survey lines at known station locations. Your task will be to plot these temperatures on a map and draw isotherms showing the distribution of the water off the Oregon coast. Two sets of data were obtained: a large scale survey that covered six survey lines with five stations per line and a fine scale survey that covered 12 survey lines with 10 stations per line. After you graph both sets of data on the included graphs, see if you can observe differences in the level of detail each graph provides.

Materials:

Pencil
3 x 5 index card or ruler
Oregon coast survey maps (attached)

Activity Procedure:

1. Place on your desk the Part 1 map and data table of temperatures for part 1.
2. Place your ruler or 3 x 5 card as a straight edge on your card along the horizontal survey line labeled "A".
3. Using the data from the part 1 table, write the temperature for each sampling station on the map. A sharp pencil or mechanical pencil is good for this part of the activity. Write the numbers at an angle so all will fit on the survey line without running into each other. Use the station numbers at the top of the map to line up your station locations.
 - Tip: If you have a 3 x 5 card, you can line up your card with the left edge of the map and write the station numbers on the card. Then as you slide the card down the map for each survey line, you will be able to line up the each station easily.
4. After you have completed the temperatures for each station on line "A" plot the temperatures for lines B through F.
5. Now draw isotherms. Along each survey line, estimate the location of whole number temperatures such as 10 °C, 11 °C, 12 °C and so on. With a smooth line connect the points that have the same temperature and label them with the temperature they represent.
6. After completing the part 1 map, repeat steps 1 through 5 for the part 2 map and data table. The part 2 map has more data points so take your time when drawing the isotherms.

Data Part 1 Water Temperature (°C)

Part 1	1	2	3	4	5
A	15	14.2	13.5	12.8	11
B	15.5	15	14.3	13	11.6
C	15.2	14.5	13.1	11.4	9.8
D	15	13.5	13	12	9.5
E	13.2	12.5	11.5	9.8	9.4
F	13.3	11	9.9	9.6	9.4

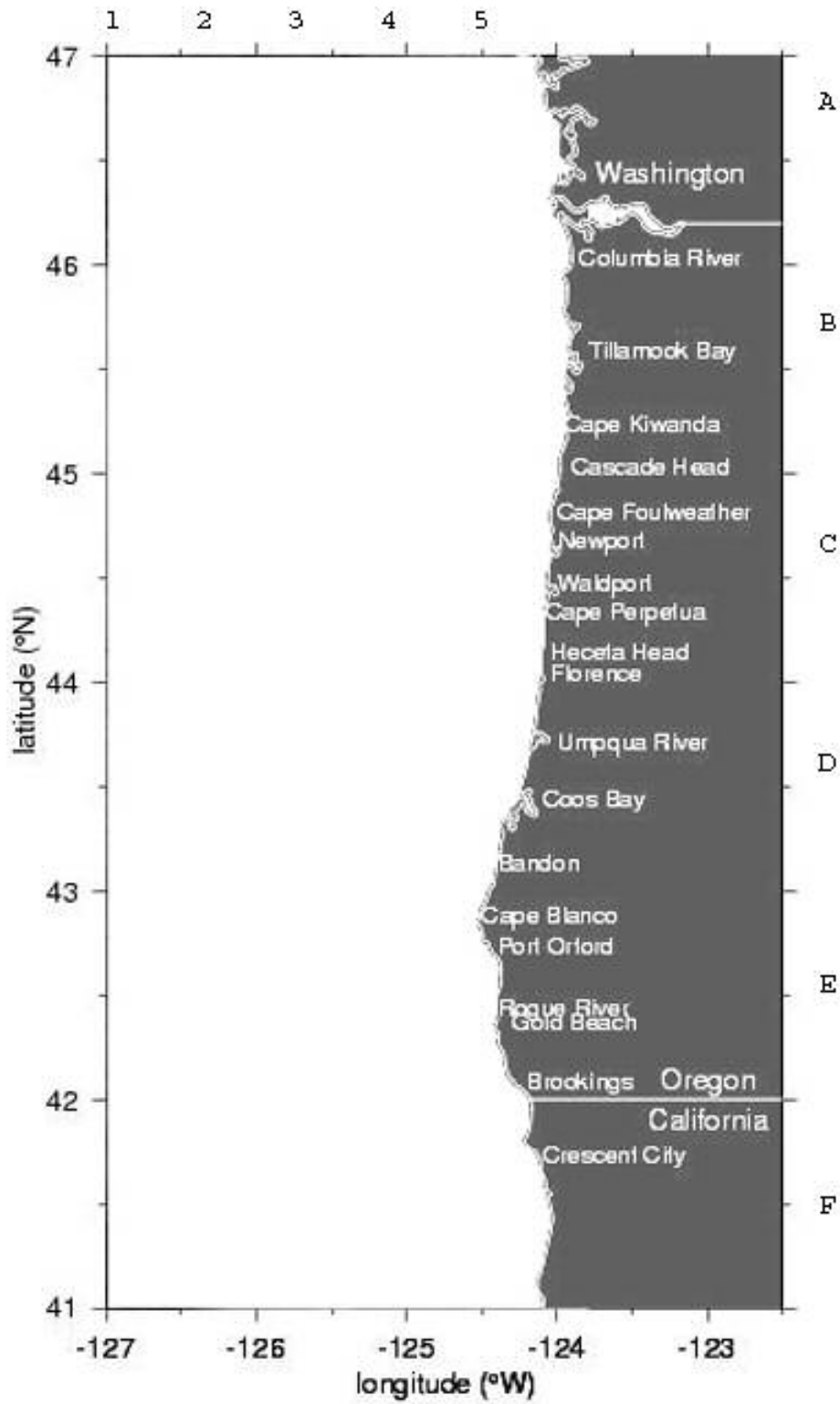
Data Part 2 Water Temperature (°C)

Part2	1	2	3	4	5	6	7	8	9	10
A	15	14.5	14.2	13.8	13.5	13.1	12.8	12.3	11	10.2
B	15.2	15	14.5	14	13.7	13.4	13.1	12.5	11.9	10.5
C	15.5	15.3	15	14.7	14.3	14.1	13	12	11.6	10.5
D	15.6	15.3	15.1	14.8	14.5	14.2	13.6	12.5	10.9	9.6
E	15.2	15	14.5	14.2	13.1	12.3	11.4	10.1	9.8	9.4
F	14.7	14.5	14.2	13.2	11	11	11	9.9	10	9.6
G	15	14.8	13.5	13.3	13	12.6	12	10	9.5	X
H	13.6	13.5	13.3	13	11	9.9	9.7	9.6	9.4	X
I	13.2	13	12.5	10	11.5	10	9.8	9.6	9.4	X
J	13	12.2	11.7	11	10.5	10	9.8	9.6	9.4	X
K	13.3	13	11	9.9	9.8	9.7	9.6	9.5	9.4	9.2
L	13.3	13.1	11	9.8	9.7	9.6	9.5	9.4	9.3	9.2

Activity Questions:

1. Describe the isotherm shapes you observed on the part 1 large scale map.
2. Describe the isotherm shapes you observed on the part 2 fine scale map.
3. Which map might be more useful for an oceanographer who is studying the temperature variations off the Oregon coast?
4. What are the advantages of doing a large scale survey similar to the part 1 map? What are the disadvantages?
5. What are the advantages of doing a fine scale survey similar to the part 2 map? What are the disadvantages?
6. What other types of research would be influenced by the choice of large or fine scale sampling? Explain your example.

Part 1 Large Scale Survey Map



Part 2 Fine Scale Survey Map

