
LAB 39

Clues to Past Climate

Purpose

The purpose of this lab is to have you utilize similar scientific techniques that paleoclimatologists use to infer about the Earth's past climate.

Materials

metric ruler
colored pencils

graph paper or
computer spreadsheet application

Procedure A

Using the diagram of a core sample from a Norwegian Spruce tree in Figure 39–1, measure the growth in millimeters for each ring of seasonal growth. Record your measurements on Table 39–1.

Next, use the data in Table 39–1 to create a dual-line graph that shows the relationship between tree growth and annual precipitation. The x -axis should be labeled “Year,” the first y -axis should be labeled “Tree Ring Growth (mm),” and the secondary y -axis should be labeled “Average Precipitation (inches).” Use a different color for each line, and label them accordingly.

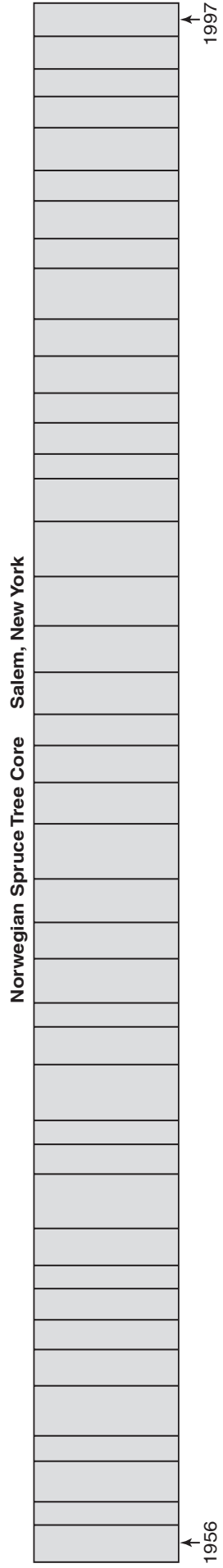


FIGURE 39-1 Norwegian Spruce Tree Core

TABLE 39-1 Tree Growth/Average Precipitation

Year	Tree Ring Growth (mm)	Average Precipitation (inches)*
1956		5
1957		2.8
1958		4.3
1959		2.3
1960		7.4
1961		2.4
1962		2.8
1963		3.1
1964		0.9
1965		4.1
1966		6
1967		1.9
1968		2.8
1969		3
1970		3.8
1971		3.4
1972		1.5
1973		2.5
1974		6.3
1975		6.9
1976		3.8
1977		7.4
1978		2.5
1979		5.7
1980		2.2
1981		4.1
1982		2.3
1983		2.6
1984		1.5
1985		4.5
1986		2
1987		7.3
1988		2.2
1989		5
1990		1.7
1991		4.5
1992		3.2
1993		4.9
1994		3.5
1995		3
1996		5.8
1997		3.3

*Average precipitation data for the Hudson Valley Region, New York State.

Procedure B

Research teams have utilized data gathered from ice cores taken in Antarctica to determine the Earth's past atmospheric carbon dioxide concentration and change in global temperature. Use the ice core data in Table 39–2 to create a dual-line graph showing the relationship between atmospheric carbon dioxide concentration and global temperature. The x -axis should be labeled “Thousands of Years Ago,” the first y -axis should be labeled “Carbon Dioxide Concentration (ppt), and the second y -axis should be labeled “Change in Global Temperature ($^{\circ}\text{C}$).” Use a different color for each line and label them accordingly.

Thousands of Years Ago	Carbon Dioxide	Change in Global Temperature
160	1.95	–9
150	2.05	–9.5
140	2.3	–7.5
130	2.95	–2
120	2.8	–2.5
110	2.7	–7
100	2.4	–4
90	2.4	–6.5
80	2.3	–5
70	2.4	–6.5
60	1.95	–7.7
50	2.18	–7.5
40	1.9	–7
30	2.2	–9
20	1.95	–10
10	2.55	–0.5
0	3.60	2.5

Conclusions

1. Using your graph that compares seasonal tree ring growth to average annual precipitation, describe the relationship between tree growth and precipitation.
2. Describe how the relationship you identified between tree ring growth and average precipitation can be used to infer past climate.
3. Using your graph of ice core data, describe the relationship between atmospheric carbon dioxide concentration and global temperature.
4. According to your ice core data, what happens to global temperature when carbon dioxide decreases?
5. According to your ice core data, what happens to global temperature when carbon dioxide increases?
6. According to your data, how long ago did the last ice age begin?
7. According to your data, how long ago did the last ice age end?