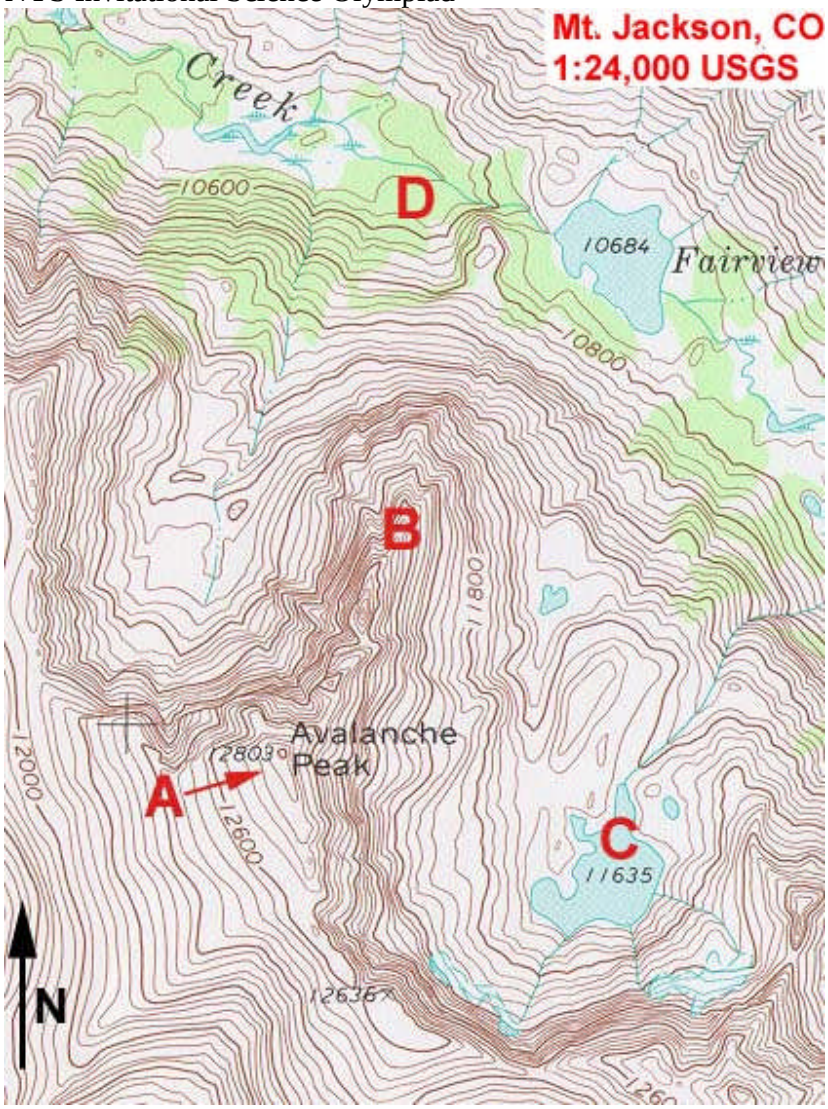


Figure 15: Topographic Map of Mt Jackson, Colorado.

Contour Interval = 40 ft

Horizontal Scale:
1 inch = 2000 ft
1: 24, 000

Glacial features identified by letters A, B, C, and D.

38. The arrow labeled with the Letter "A" is pointing toward Avalanche Peak. This is an example of what type of landform?

39. a. The letter "B" is on a landform that extends from This is an example of what type of landform type of landform is this an example of?

b. How did the shape and spacing of the contour lines help you determine the type of landform?

40. a. What is the name for the landform to the south, south-southeast and south-southwest of the letter "C" shown with brown contour lines?

b. What is the name of the type of lake at C?

41. The letter "D" is in a valley. Draw a sketch showing a profile *across* the valley.

The Table below provides information on the size (area in km2) of the Sperry Glacier from 1901- 1979 (Carrara & McGimsey, 1988).

Year	Area (km^2)
1901	3.71
1913	3.41
1927	1.99
1938	1.71
1946	1.50
1950	1.29
1960	1.24
1966	1.12
1979	1.06

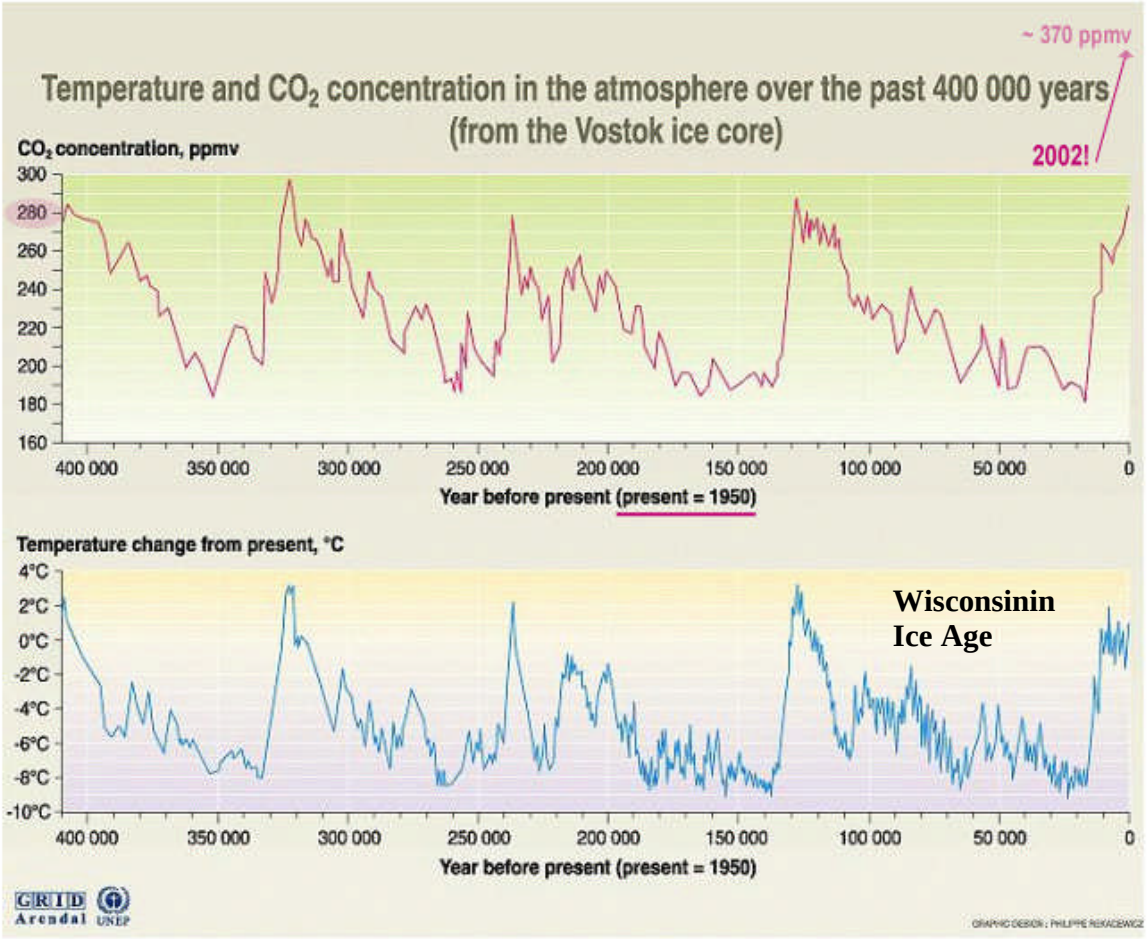
42. What has happened to the area of the Sperry Glacier from 1901 – 1979?

43. What is the relationship between ablation and accumulation for the Sperry Glacier?

44. What does this indicate about climatic conditions during this period?

45. Although the data indicate glacial retreat throughout the 20th century, rocks have been observed moving forward on the glacier. Explain how rocks can be moving forward while the glacier is shrinking?

46. The causes of the Ice Ages are still debated by scientists. Identify two theories glaciologists believe to be responsible for the Ice Ages.



Source: J.R. Petit, J. Jouzel, et al. Climate and atmospheric history of the past 420 000 years from the Vostok ice core in Antarctica, Nature 399 (3JUne), pp 429-436, 1999.

(Note: 2002 information added to diagram)

Figure 16: Temperature and carbon dioxide ($C0_2$) data were obtained from the Vostok Ice Core drilled in Antarctica. These graphs illustrate how temperatures and concentration of CO_2 fluctuated over the past 400,000 years. $C0_2$ concentration is measured in parts per million by volume (pomp) and temperature change is measured in degrees Celsius (^oC).

(http://www.sierraclub.ca/national/programs/atmosphere-energy/climate-change/vostok-ice-core.jpg)

47. Explain how scientists can determine the amounts of CO_2 in the atmosphere during the past 400,000 years?

48. What is the name of the geologic epoch that encompasses much of the past 400,000 years?

49. Describe the relationship between carbon dioxide (CO_2) concentration and temperature trends during the past 400,000 years?

50. Ice ages are identified by their cooler temperatures.

a) When, according to the temperature graph, did the last ice age (Wisconsinin) end?

b) What was the temperature difference in Antarctica at that time with respect to that of current temperatures?

c) According to the data, approximately how long did the Wisconsinin Ice Age last?

51. According to the data, how many Ice Ages have there been in the past 400,000 years?

52. a. CO_2 concentration in 2002 was 370 ppmv. If current trends continue, what will be the effect on the world's glaciers?

b. Describe the effect this trend might have upon the coastal areas of the world?

Credit. This exam was created by and submitted for publication on The Wright Center website by Gary Vorwald, New York State Science Olympiad Dynamic Planet Event Supervisor.