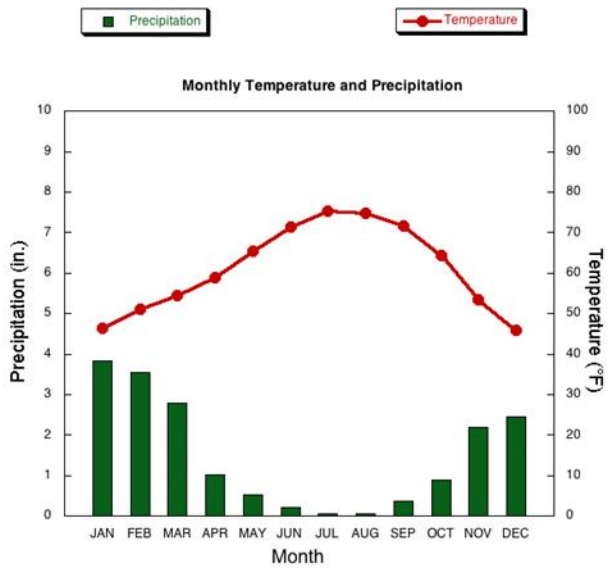
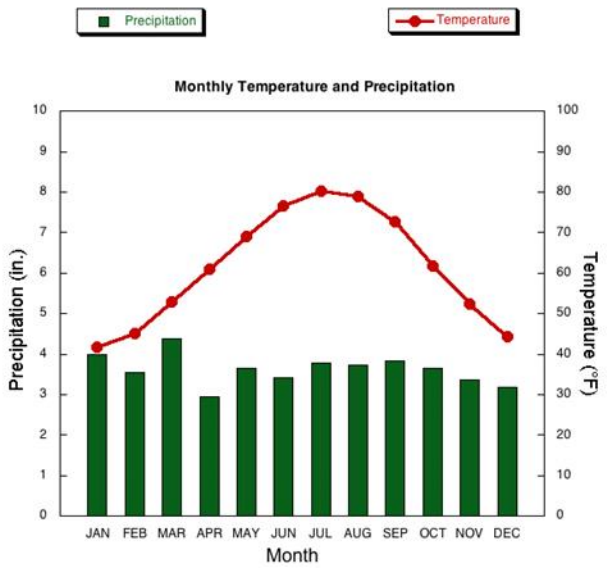
Sacramento, CA



Charlotte, NC



1. What is the name of the diagram above?
    a. Climatograph
    b. Hodograph
    c. Precipitation-temperature (PT) diagram
    d. Potential evapotranspiration diagram

2. Diagrams like this one typically use climate data spanning how many years?
    a. 10 years
    b. 15 years
    c. 20 years
    d. 25 years
    e. 30 years

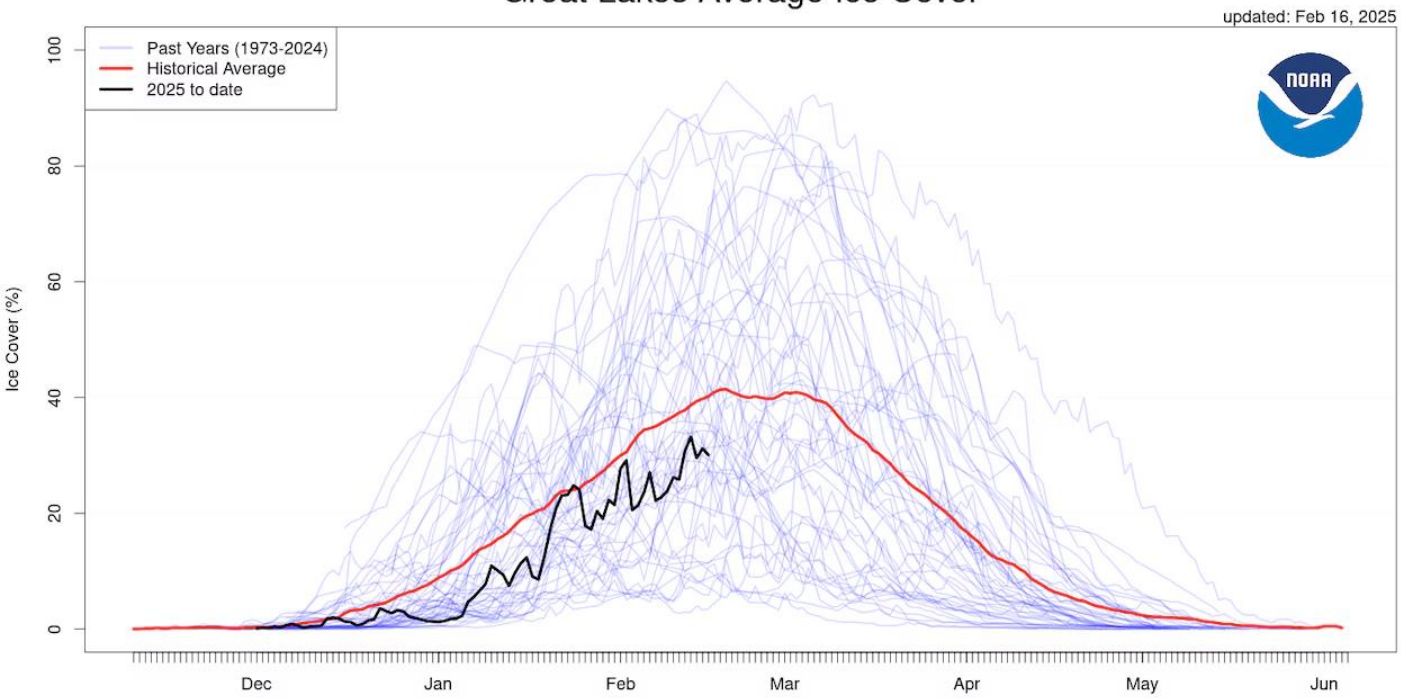
3. Which location experiences the highest average monthly temperature?
    a. Sacramento, CA
    b. Charlotte, NC

4. Which location has the most seasonal precipitation?
    a. Sacramento, CA
    b. Charlotte, NC

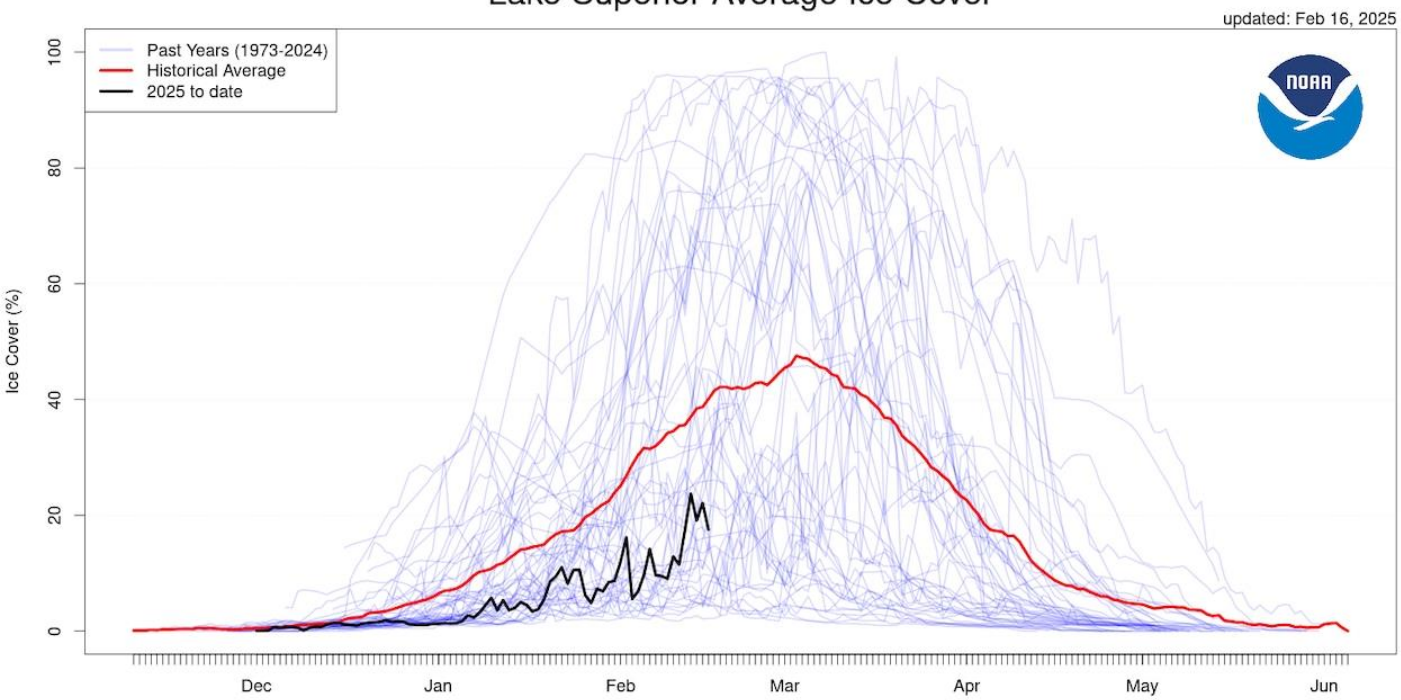
5. Which location's climatology lends to the greatest risk of wildfire?
    a. Sacramento, CA
    b. Charlotte, NC

6. Which of the following would have the *least* significant effect on a location's wildfire risk?
    a. Changes in atmospheric aerosol optical depth
    b. Changes in average temperature
    c. Changes in convective thunderstorm activity
    d. Changes in precipitation amount or seasonality

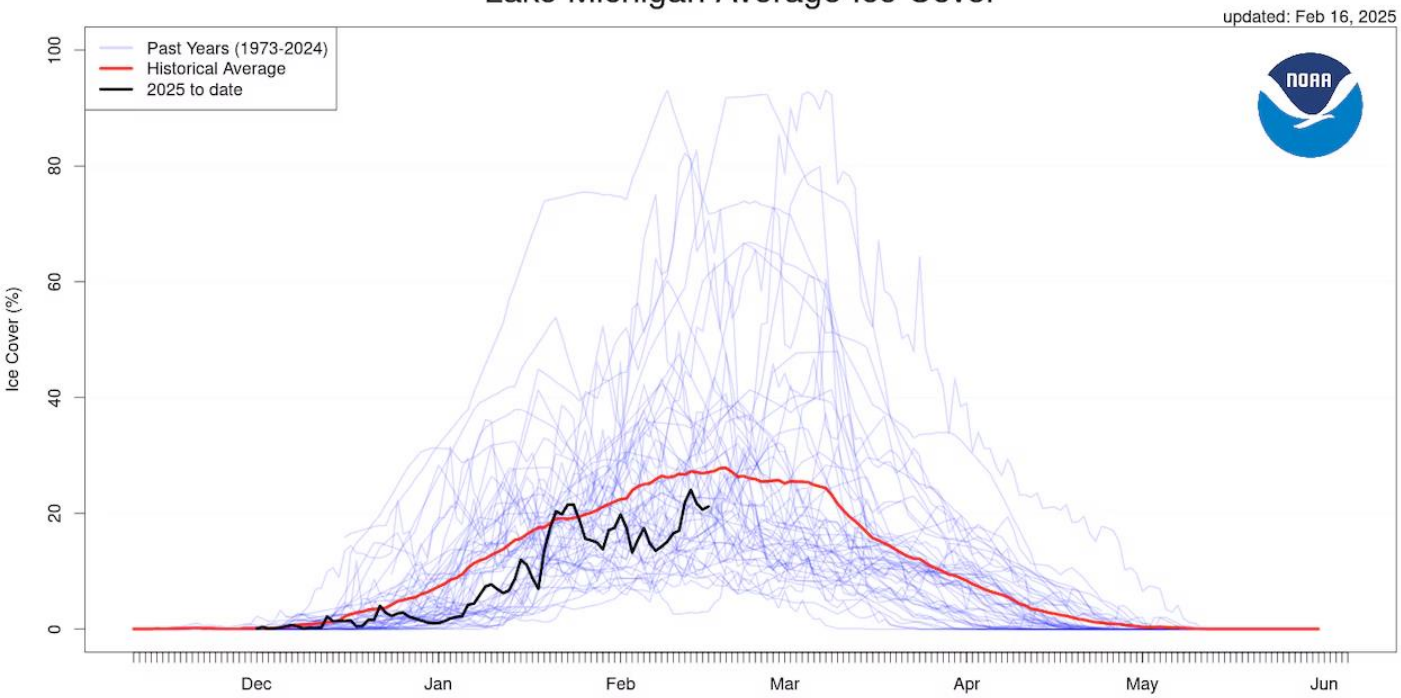
Great Lakes Average Ice Cover



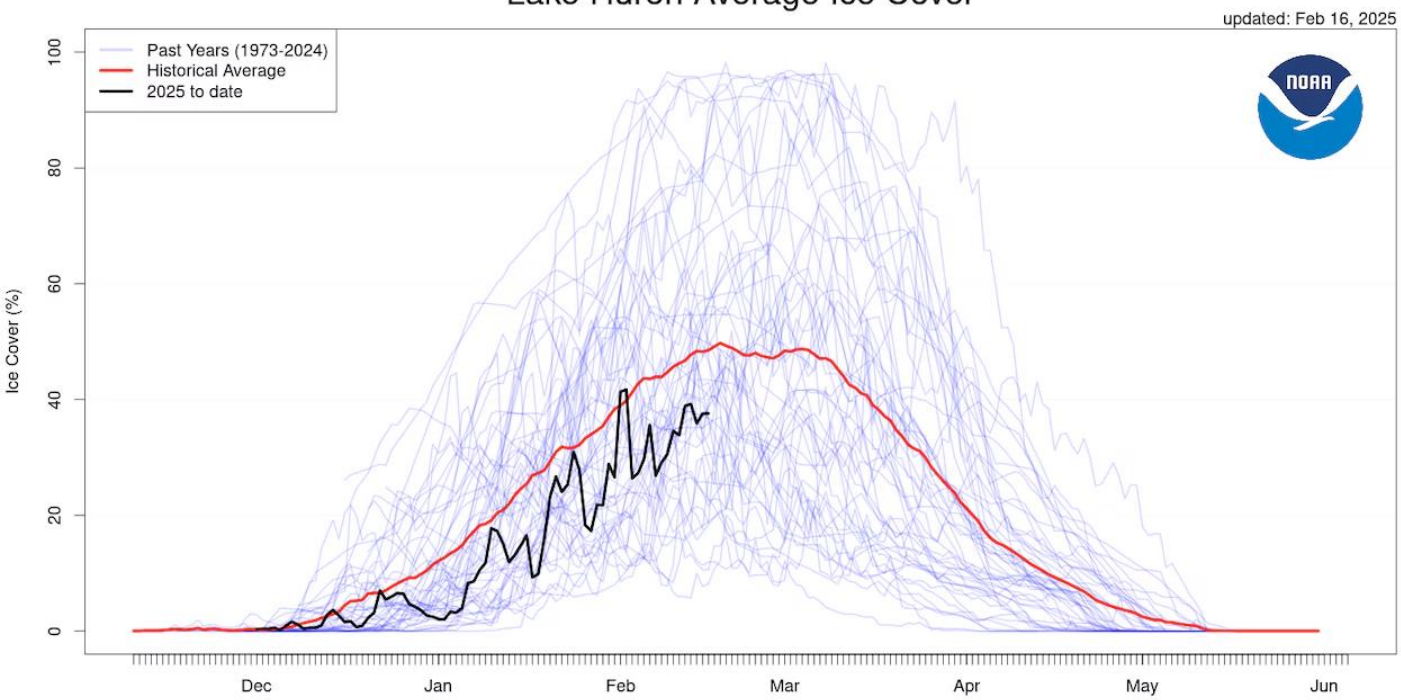
Lake Superior Average Ice Cover



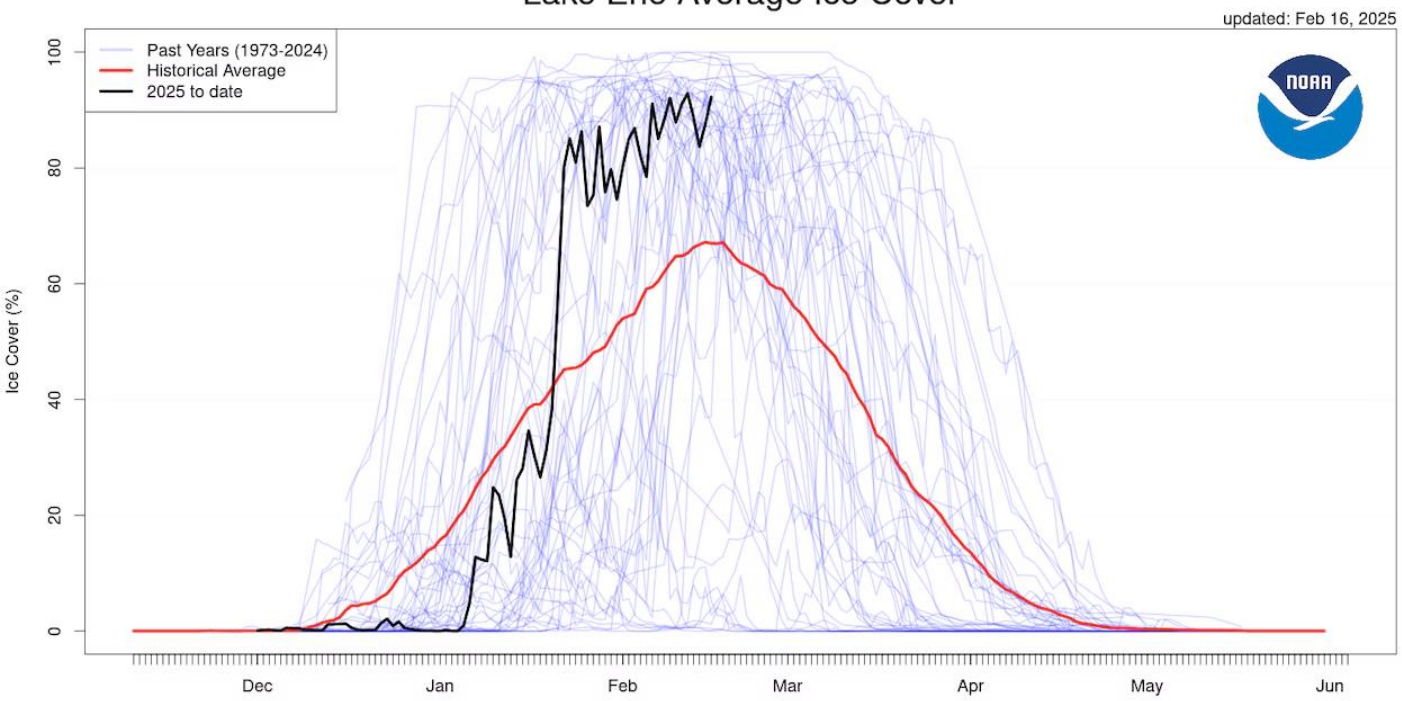
Lake Michigan Average Ice Cover



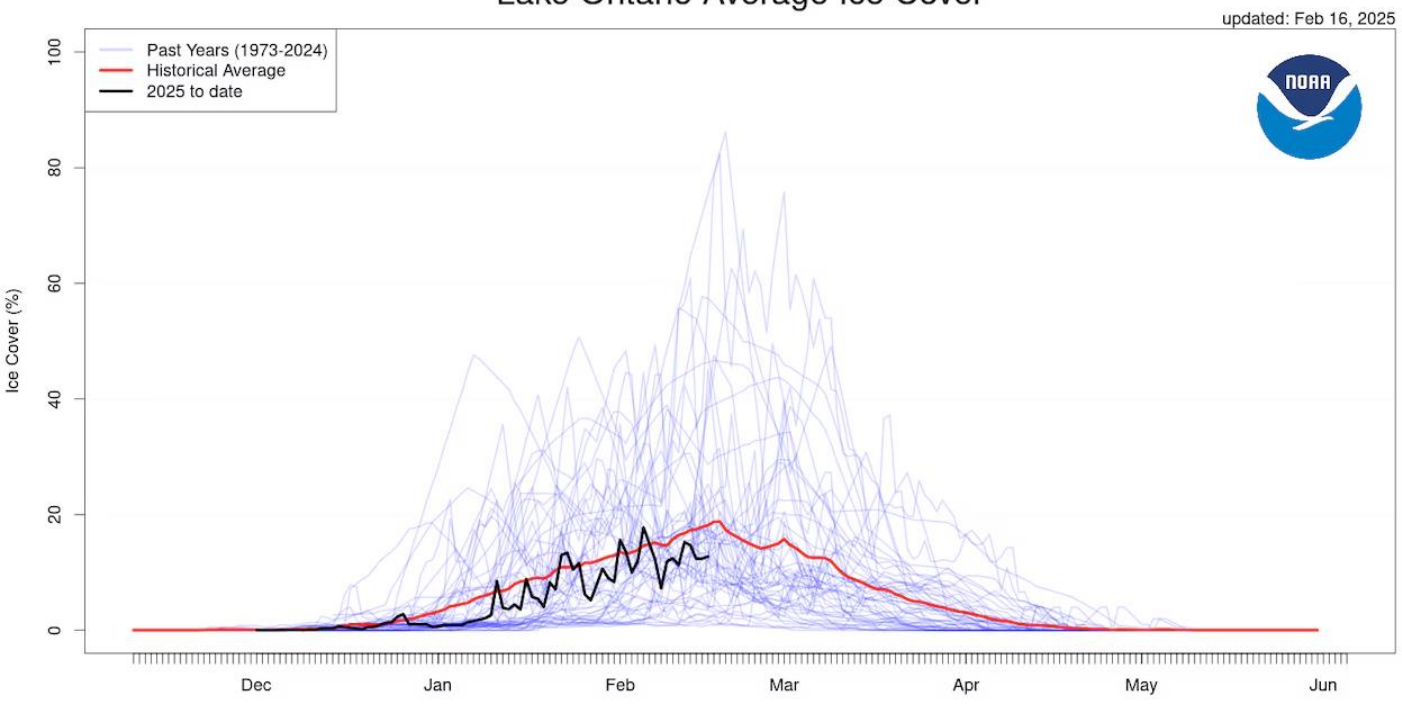
Lake Huron Average Ice Cover



Lake Erie Average Ice Cover



Lake Ontario Average Ice Cover



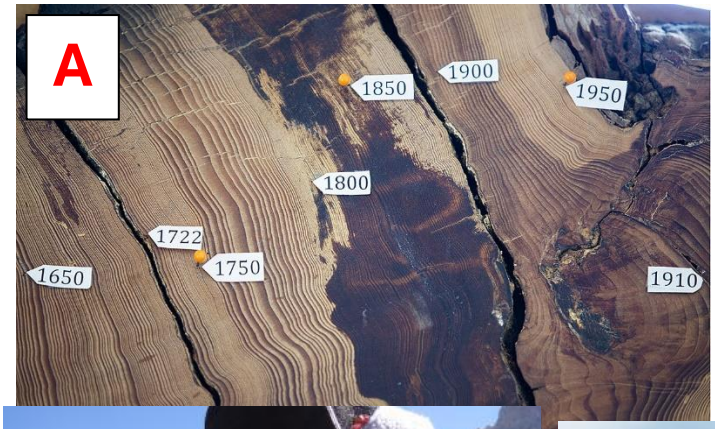
7. How many past years of data are included in the Great Lakes ice coverage charts?
    a. 30 years
    b. 41 years
    c. 52 years
    d. 77 years
    e. None of the above

8. Across all Great Lakes, ice coverage most typically peaks around
    a. Late January to Early February
    b. Early February to late February
    c. Late February to Early March
    d. Early March to Late March
    e. Late March to Early April

9. As of February 16th, ice coverage was below the historical average on all lakes except
    a. Lake Superior
    b. Lake Michigan
    c. Lake Huron
    d. Lake Erie
    e. Lake Ontario

10. Annual Great Lakes ice coverage has declined since the start of this data record, which has generally resulted in
    a. Decreased lake-effect snow
    b. Increased lake-effect snow
    c. Decreased greenhouse gas emissions
    d. Increased greenhouse gas emissions

For questions 1 through 6, the answer choices are indicated in the pictures below.



Match each of the photos above to how far in the past they can typically tell us about climate.

1. About 150 years ago _____

2. About 5,000 years ago _____

3. About 15,000 years ago _____

4. About 750,000 years ago _____

5. Which of the photos above shows the most reliable source of climate data?

   _____

6. Which of the photos above shows the best method for observing impacts due to cyclical changes in Earth's orbit?

   _____

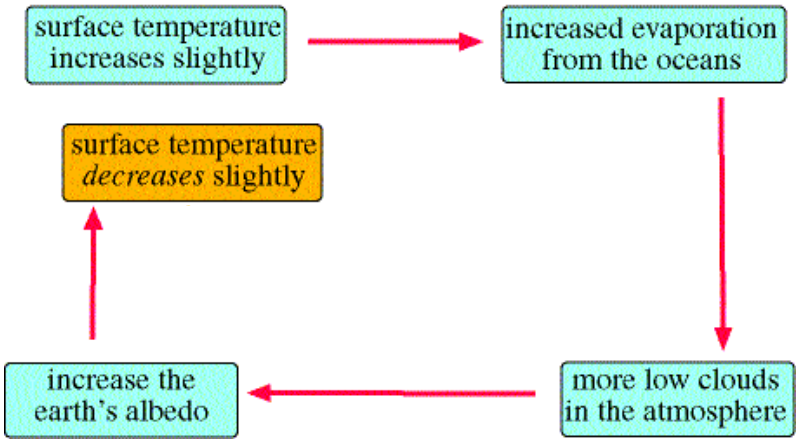


Diagram A

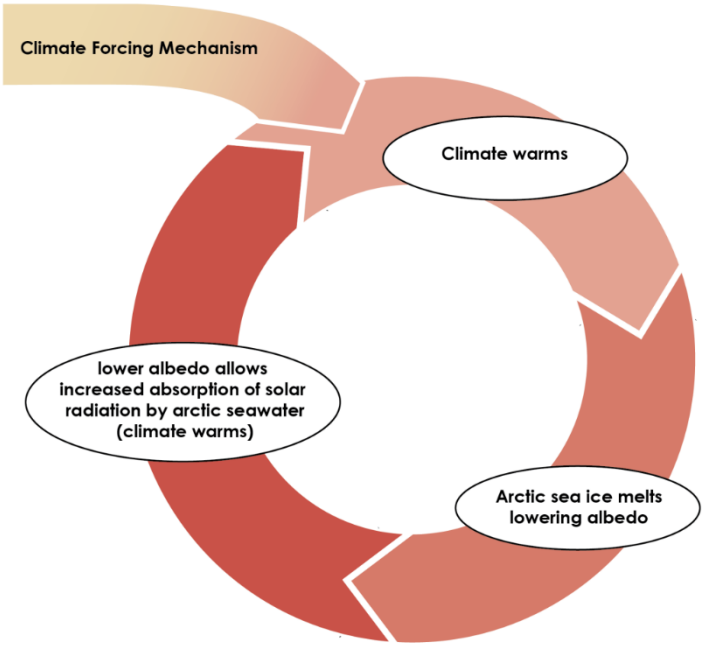
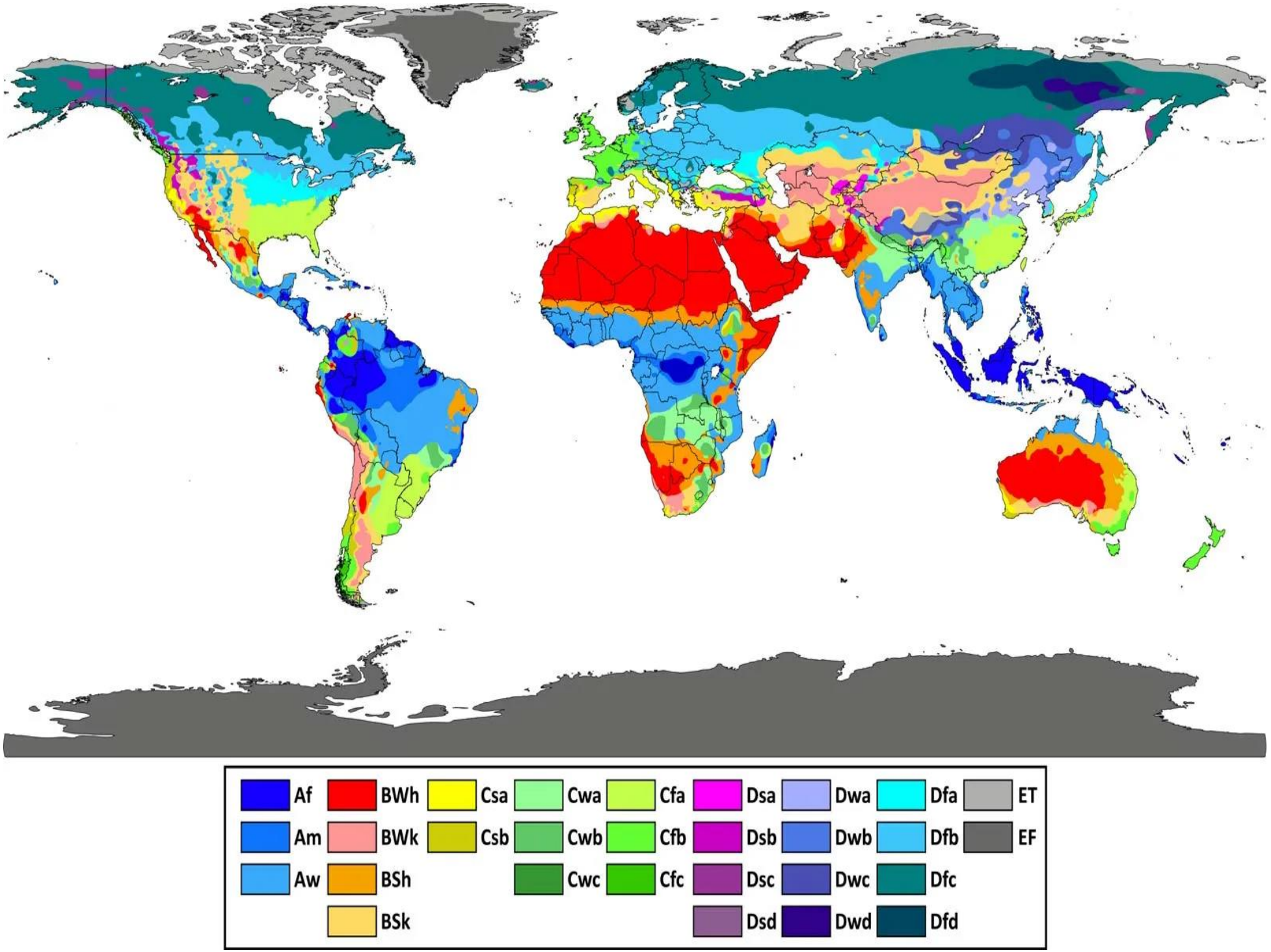


Diagram B

7. Which diagram shows an example of a "positive" feedback system?
    a. Diagram A
    b. Diagram B
    c. Both diagrams
    d. Neither diagram

8. Which diagram shows an example of a feedback system that may be referred to as a "balancing" feedback system?
    a. Diagram A
    b. Diagram B
    c. Both diagrams
    d. Neither diagram

9. What would be the result if the feedback system shown in Diagram B instead experienced an initial cooling of climate?
    a. A further cooling effect
    b. A warming effect that returns the system to equilibrium
    c. A strong warming effect that warms the system more than before the cooling effect
    d. None of the above


Af
Am
Aw
BWh
BWk
BSh
BSk
Csa
Csb
Cwa
Cwb
Cwc
Cfa
Cfb
Cfc
Dsa
Dsb
Dsc
Dsd
Dwa
Dwb
Dwc
Dwd
Dfa
Dfb
Dfc
Dfd
ET
EF

1. What is the name of the classification system shown in the map?
    a. Thornthwaite
    b. Köppen
    c. Trewartha
    d. USDA Plant Hardiness
    e. None of the above

2. Which of the 29 classification codes shown in the map is most closely associated with tropical rainforests?

3. Which major category is used to denote dry and arid climates?
    a. A
    b. B
    c. C
    d. D
    e. E

4. Which two of the 29 classification codes do the climates of Michigan get categorized into?

5. Which two factors are the most important with respect to the geographic extent of “E”-category climates? (Select two)
    a. Degree of urbanization
    b. Latitude
    c. Longitude
    d. Elevation
    e. Nearby topography (rain shadows)
    f. Surface ocean currents
    g. Prevailing wind direction
    h. Continentality

Chart A

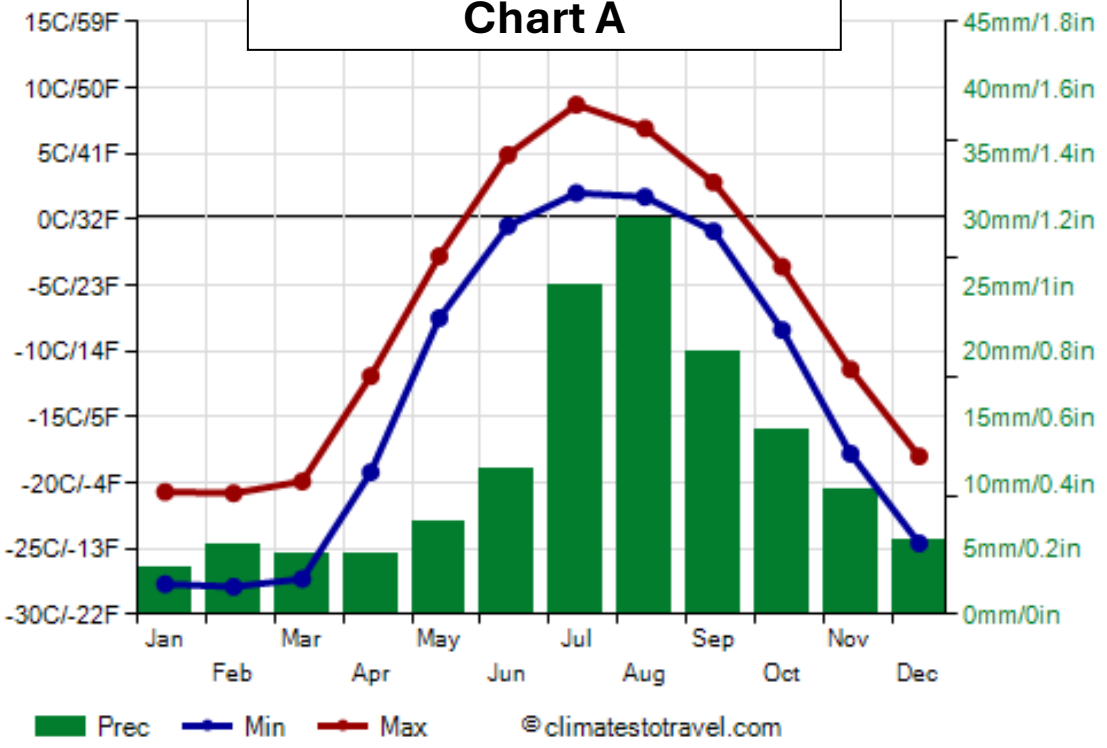


Chart B

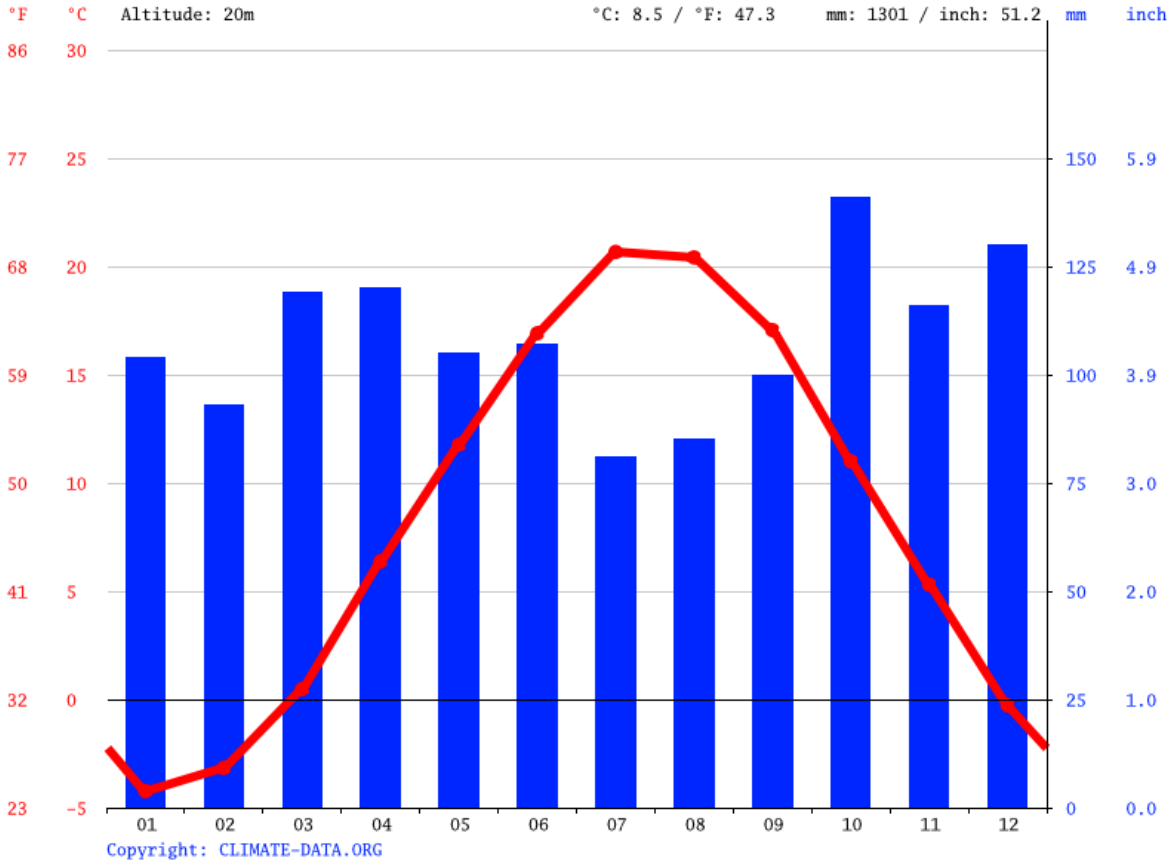


Chart C

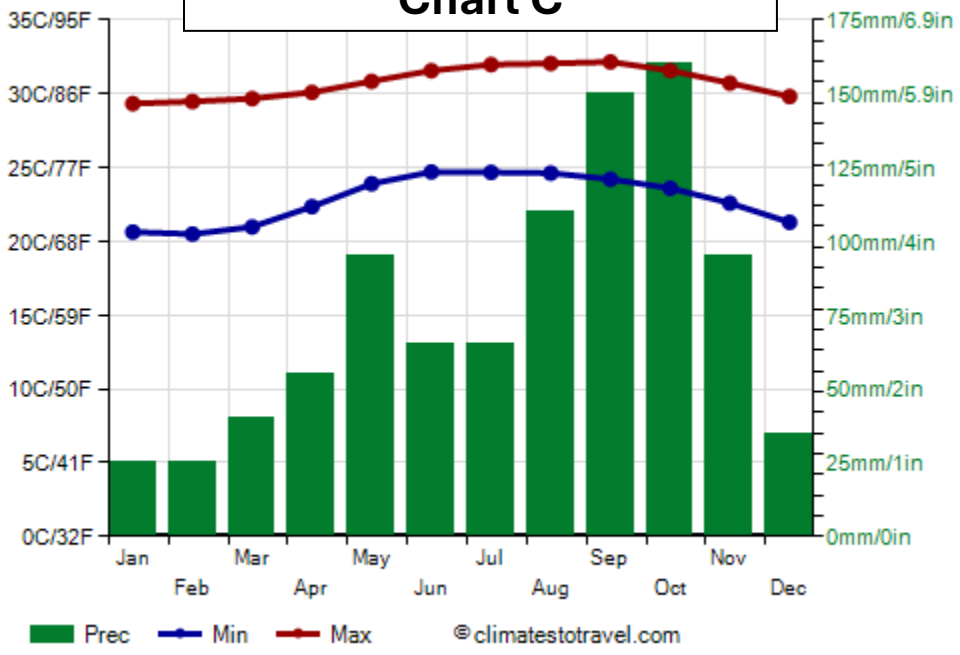
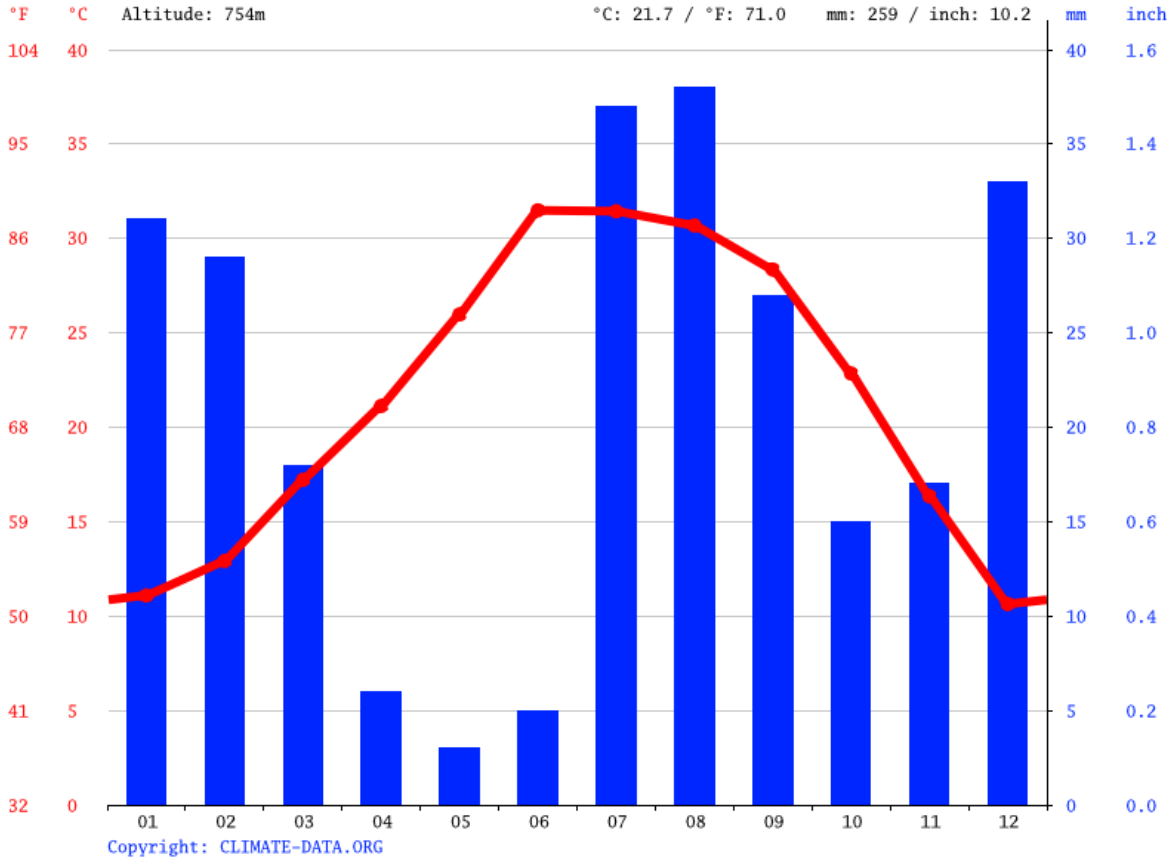


Chart D



For questions 6 through 9, match the Chart (A, B, C, D) to the climate classification.

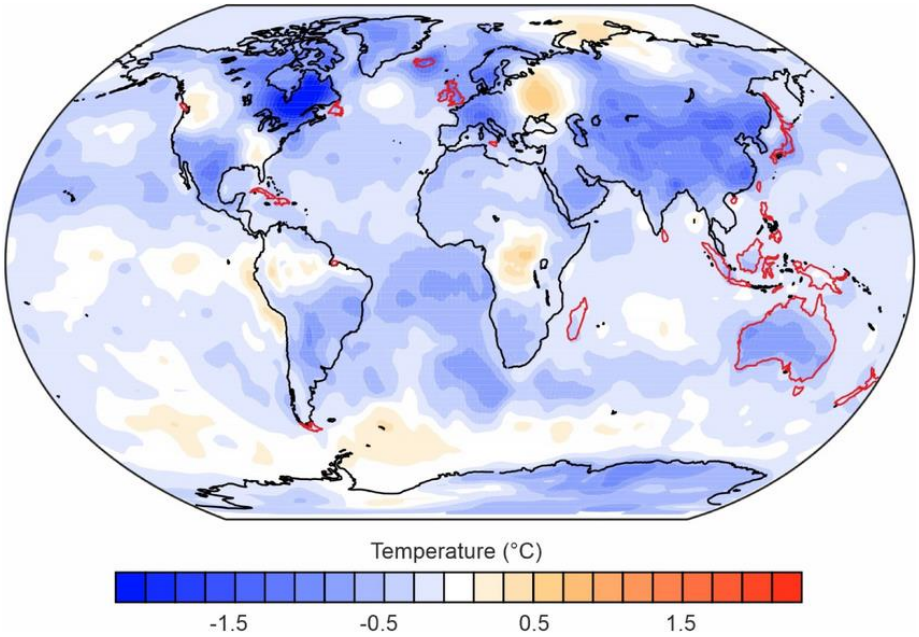
6. Am (Monsoon)

7. BWh (Hot desert)

8. Dfb (Warm-summer humid continental)

9. ET (Tundra)

“The Year Without a Summer”

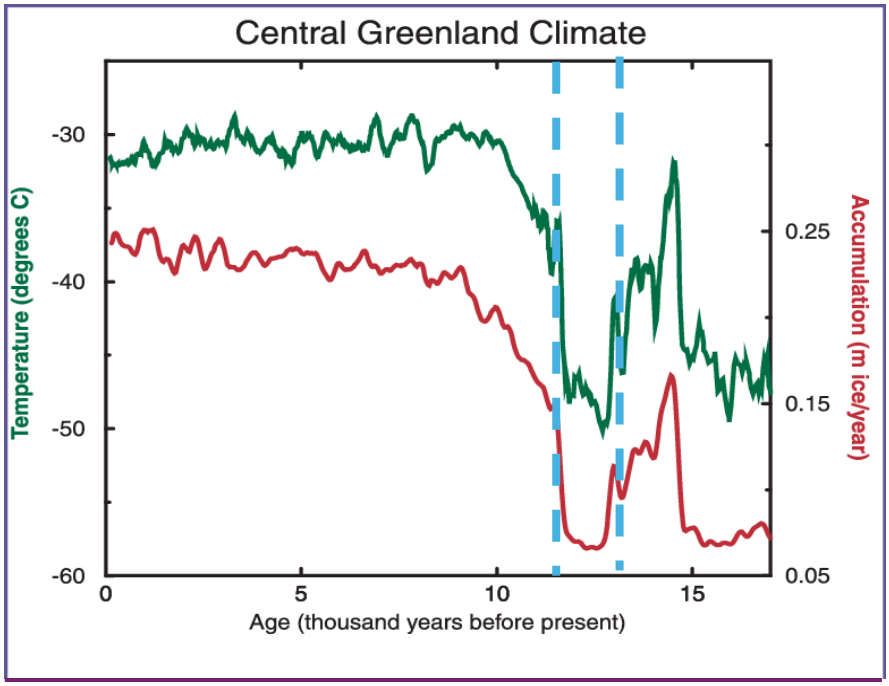


1. The map above shows mean temperature anomalies from the year _____ as compared to a preceding 30-year period.
    a. 1812
    b. 1816
    c. 1824
    d. 1883

2. Which of the following best summarizes the data shown in the map?
    a. All locations experienced mean temperatures significantly lower than average
    b. Most locations experienced mean temperatures that were lower in the summer than during the winter
    c. Globally, there were lower temperatures than average
    d. Many locations globally experienced sub-freezing minimum temperatures

3. Which of the following is often attributed as the cause of the temperature anomalies shown?
    a. A meteor impact near Hudson Bay in Canada
    b. Cloud-seeding experiments by scientists in the Russian Empire
    c. A volcanic eruption in the Indonesian archipelago
    d. A minimum in a solar Schwabe cycle

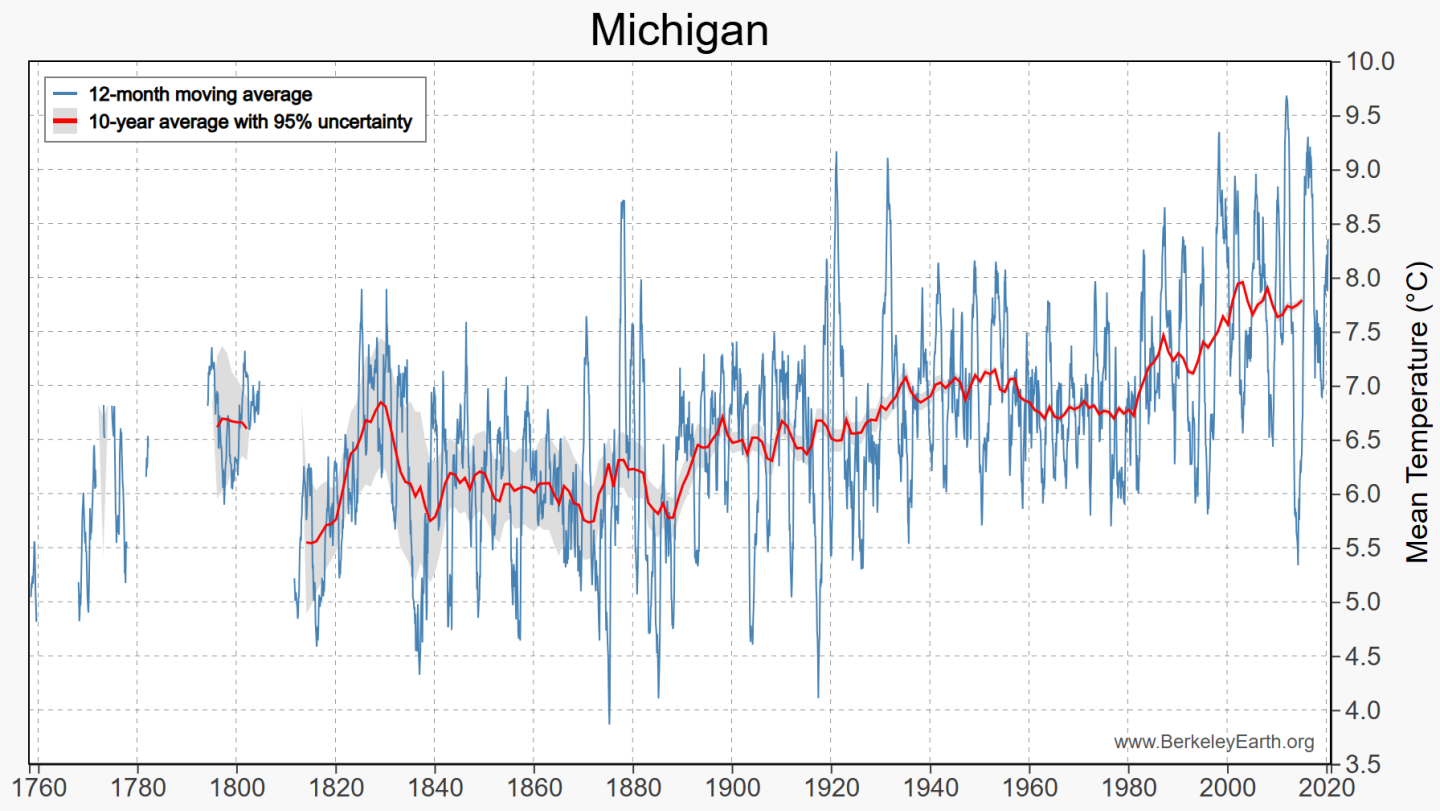
4. Which of the following describes the mechanism by which this cooling occurred?
    a. Increased albedo due to increased sea ice
    b. Increased albedo due to stratospheric sulfur aerosols
    c. Decreased ratio of high-clouds to low-clouds
    d. Decreased insolation due to fewer sunspots



5. What is the name of the climate event indicated between the dashed blue lines in the chart?
    a. Little Ice Age
    b. Holocene glaciation
    c. Younger Dryas
    d. Medieval Maximum

6. The leading theory explaining why this event occurred is
    a. A sudden decrease in carbon dioxide levels due to vegetation growth in recently de-glaciated areas
    b. A large meteor impact over North America
    c. Disruption of thermohaline ocean currents due to freshwater from melting glaciers
    d. Volcanic aerosols entering the stratosphere

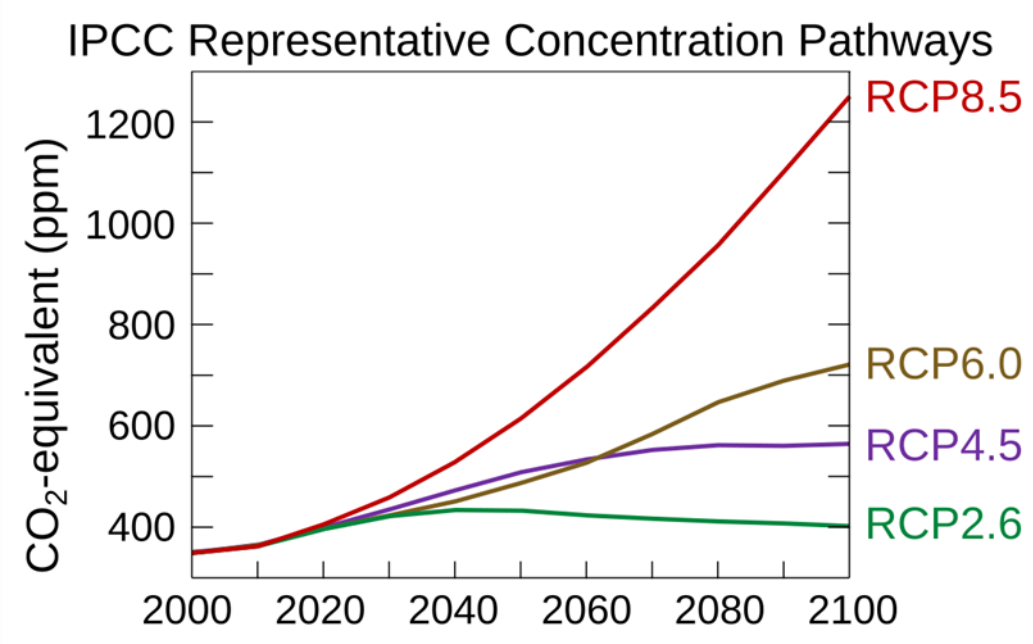
7. Which of the following best describes how scientists can estimate temperatures in Greenland before, during, and after this event by using ice cores?
    a. Scientists compare the relative abundance of oxygen-16 and oxygen-18 isotopes to one another
    b. Scientists compare the thickness of cryo-varves which indicate the amounts of net accumulation or ablation of the ice sheet
    c. Scientists measure the temperature of atmospheric gases trapped in air bubbles within the ice
    d. All of the above
    e. None of the above



1. How is the 10-year average mean temperature (red line) in the above chart calculated?
    a. It is the average of the 10 years preceding
    b. It is the average of the 5 years preceding and 5 years following
    c. It is the average of the 10 years following
    d. None of the above

2. As compared to the 12-month average mean temperature, the 10-year average
    a. Is much lower
    b. Is much higher
    c. Has much more uncertainty
    d. Is much less volatile

3. Between 1980 and 2000, the 10-year average mean temperature in Michigan increased by roughly
    a. 0.4°C
    b. 0.8°C
    c. 1.5°C
    d. None of the above (it decreased)



4. The number of an RCP (e.g. RCP**#.#**) indicates a scenario in which
    a. Radiative forcing is "#.#" W/m^2 higher in year 2100 than 1750
    b. Annual CO_2-equivalent emissions are limited to "#.#" ppm per year by year 2100
    c. Radiative forcing is "#.#" times higher in year 2100 than 1750
    d. Temperature increase between years 1750 and 2100 are limited to "#.#" degrees Celsius

5. In which of the four RCP scenarios shown would the wildfire risk be greatest by 2100?
    a. RCP2.6
    b. RCP4.5
    c. RCP6.0
    d. RCP8.5

6. Which RCP corresponds to the warming-limit goal of the Paris Agreement
    a. RCP2.6
    b. RCP4.5
    c. RCP6.0
    d. RCP8.5
    e. None of the above

7. The IPCC began using the four RCPs shown for projecting climate change beginning in their
    a. 4th Assessment Report ('07)
    b. 5th Assessment Report ('13-'14)
    c. 6th Assessment Report ('21-'22)
    d. Special Report on the Ocean and Cryosphere in a Changing Climate ('19)