Measuring Earth's Magnetic Field

Overview:

Students become familiar with two kinds of magnetometers used to detect the aurora and learn the locations of magnetometers in Alaska.

Objectives:

The student will:

- identify two types of magnetometers in Alaska;
- locate Magnetometer Data Sites in Alaska; and
- conclude instruments scientists use to study the aurora are improving over time.

Materials:

- VISUAL AID: "Magnetometers"
- STUDENT WORKSHEET: "Instrument Identification"
- STUDENT WORKSHEET: "Alaska Magnetometer Data Sites"

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Activity Procedure:

1. Remind students how Elias Loomis made personal observations of the aurora. Today scientists combine personal observations with scientific instruments to observe the aurora. Improving technology allows detailed and accurate information to be collected.

2. A magnetometer is one instrument scientists use to detect changes in Earth's magnetic field. Magnetometers are used to measure the aurora, which generates its own magnetic field, and therefore changes Earth's magnetic field. Magnetometers are used to detect the aurora when it is not visible in the day or hidden by clouds at night. Magnetometers placed around the world permit scientists to quickly get a global picture of the aurora.

3. Hand out the STUDENT WORKSHEET: "Instrument Identification" and use VISUAL AID: "Magnetometers" to discuss the differences between induction and fluxgate magnetometers. Explain that fluxgate magnetometers measure the strength of Earth's magnetic field. By contrast, induction magnetometers measure how fast Earth's magnetic field is changing. Because the aurora changes Earth's magnetic field, the induction magnetometer is the basic scientific tool used around the world to detect and measure the aurora.

4. After students have completed and turned in their STUDENT WORKSHEET: "Instrument Identification," hand out the STUDENT WORKSHEET: "Alaska Magnetometer Data Sites." To label the cities on this worksheet, students will need to visit the *Geophysical Institute* Magnetometer Array website: http://magnet.gi.alaska.edu.

Answers to Student Worksheets:

Instrument Identifications:

1. magnetic fields or the aurora

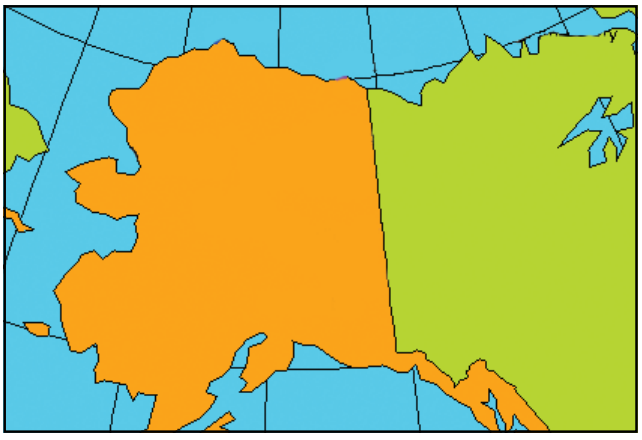
2. D. all of the above

3A. fluxgate magnetometer

3B. induction magnetometer

4. NOTE: Preview website for current active magnetometers and record current locations on the map at right.

Alaska Magnetometer Data Sites:



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Name:_____ **Student Worksheet**

Instrument Identification

1. What does a magnetometer measure?_____

_____

2. A magnetometer can be used to detect the aurora:

   A. during the day
   B. at night
   C. when it is cloudy
   D. all of the above

3. Label the magnetometers below.

A.

_____

This magnetometer measures the strength of Earth's magnetic field.

B.

_____

This magnetometer measures how fast Earth's magnetic field is changing.

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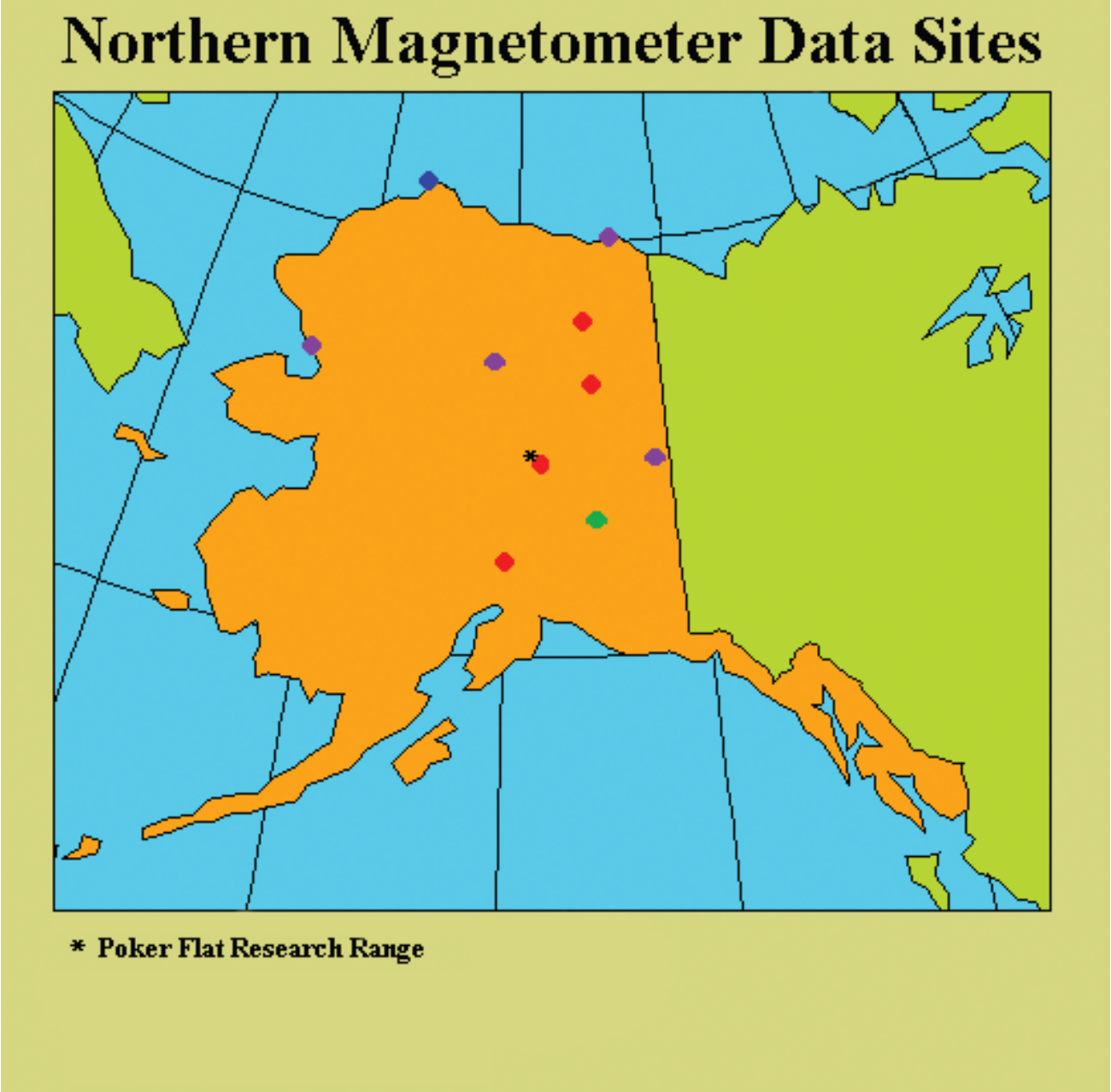
Name:_____ **Student Worksheet**

Alaska Magnetometer Data Sites

Directions: Label the Alaska cities that contain active magnetometer sites on the map below.



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