

Details



Completion Time: Less than a week

Permission: Download and Share

The Mystery of the Destroyed Weather Station

Overview:

Students use data and pictures of a destroyed wind sensor, to develop a theory of what happened to the station. They then develop a plan to make sure the station is not destroyed again.

Objectives:

Students will be able to use data to develop a reasonable hypothesis.

Lesson Preparation:

It would be helpful to give students a brief overview of the location of Antarctica and McMurdo's location within the continent. It would also be helpful, although not necessary, to have students review some of the journals from the 2007 Antarctic Weather Stations expeditions. Giving students an explanation of how to read a meteogram and the text data shown on the weather station's website will also be helpful. Remind students to keep in mind that the wind speed listed is in meters/second.

Procedure:

Solving problems and investigating mysteries are two of the things scientists do often, especially field researchers. A field scientist not only has to understand and study the science, but they also have to make sure that their equipment works in the field. Often they design, build and repair their own equipment. In this assignment you will use the internet, real pictures, maps, real data and your brain to develop a hypothesis of what happened to the

Materials

- Student Instructions
- Internet access (or preprinted webpages)
- Printed pictures of weather station
- McMurdo Sound map



wind sensor on a remote automated weather station in Antarctica. This is an actual situation that a group of meteorologists from the University of Wisconsin- Madison found on one of their weather stations. You can email your ideas to the science teacher who was in Antarctica working with the researchers at kbeckendorf@polartrec.com.

On January 27th, 2008 meteorologists, Shelley Knuth and Jonathan Thom, traveled by helicopter from McMurdo Station to the Mt. Fleming weather station. The weather station collects weather data and automatically sends the data to satellites every 200 seconds. The data is then sent back to computers on Earth which loads the information onto the internet. Use the following websites to answer the following. *What weather conditions does the Mt. Fleming weather station measure? What are the current weather conditions at the Mt. Fleming station?* You will need to use the Mt. Fleming and McMurdo website to get the latitude and longitude. *Use the lat and long to plot the locations of McMurdo and the Mt. Fleming station and then trace their probable route on your map. How many miles would they have traveled?*

McMurdo Website

<http://www.nsf.gov/od/opp/support/mcmurdo.jsp>

Mt. Fleming and other Antarctic weather station websites

<http://uwamrc.ssec.wisc.edu/aws/mtflemingmain.html>

<http://uwamrc.ssec.wisc.edu/realaws.html>

Shelley and Jonathan specifically went to the Mt. Fleming station because it had stopped transmitting wind speed and direction, but they did not know why. When they arrived the two scientists found something that none of the meteorologists had every seen in the 25+ years of working in Antarctica. The wind sensor had been broken off the station; both ends (the vane and the “propeller” sections) had broken off and were completely gone. (See the accompanying pictures). The “mtfleming06” photo shows the weather station when it was installed in 2006. If you zoom in you can see how the wind sensor was originally installed.

Several things that you should know before you begin your investigation. Look at the “MtFlemingWindSensor” picture. The “propeller” spins very freely with very little friction. Also look at the “BrokenWindSensor1” picture the larger black sleeve at the base of the wind vane spins very freely around the narrower black section, again with very little friction. When the wind blows, the wide vane is pushed by the wind and turns parallel with the wind and the propeller turns into the wind. When Jonathan and Shelley found the sensor, both of these parts still rotated freely. Electronic sensors measure how fast the propeller is spinning, that is then used to calculate the wind speed.

So here is your assignment. Study these pictures, study the weather data from the online



webpage. Then develop a theory of how and why the wind sensor broke off. Your explanation should be detailed and should be supported by the pictures and the weather data. Your explanation should explain; how each end broke off, how each piece disappeared, why the part that was found did not disappear, the direction at which the metal bracket broke. *On your paper write your explanation, followed by the evidence that supports your theory and how it supports your idea. In addition, based on your idea write a way to improve the station design so this doesn't happen again. You will be turning in your written explanation plus you will be presenting your idea to the class.*

Extension:

Contact the AMRC scientists and ask for the weather data prior to the station going off the air. See if the weather data supports your theory of what happened to the weather station.

Resources:

<http://uwamrc.ssec.wisc.edu/aws/mtflemingmain.html>

<http://uwamrc.ssec.wisc.edu/realaws.html>

<http://www.nsf.gov/od/opp/support/mcmurdo.jsp>

Assessment:

N/A

Credits:

Kirk Beckendorf

kbeckendorf@polartrec.com



National Science Education Standards (NSES):

NSES Content Standards, Grades 5-8

Content Standard A: Science As Inquiry

- a. Abilities necessary to do scientific inquiry
- b. Understandings about scientific inquiry

Content Standard E: Science and Technology

- a. Abilities of technological design
- b. Understandings about science and technology

Content Standard G: History and Nature of Science

- a. Science as a human endeavor
- b. Nature of science

NSES Content Standards, Grades 9-12

Content Standard A: Science As Inquiry

- a. Abilities necessary to do scientific inquiry
- b. Understandings about scientific inquiry

Content Standard E: Science and Technology

- b. Understandings about science and technology

Content Standard G: History and Nature of Science

- a. Science as a human endeavor
- b. Nature of scientific knowledge

Other Standards:

N/A

Broken Wind Sensor Lesson: Student Instructions

Solving problems and investigating mysteries are two of the things scientists do often, especially field researchers. A field scientist not only has to understand and study the science, but they also have to make sure that their equipment works in the field. Often they design, build and repair their own equipment. In this assignment you will use the internet, real pictures, maps, real data and your brain to develop a hypothesis of what happened to the wind sensor on a remote automated weather station in Antarctica. This is an actual situation that a group of meteorologists from the University of Wisconsin-Madison found on one of their weather stations. You can email your ideas to the science teacher who was in Antarctica working with the researchers at kbeckendorf@polartrec.com.

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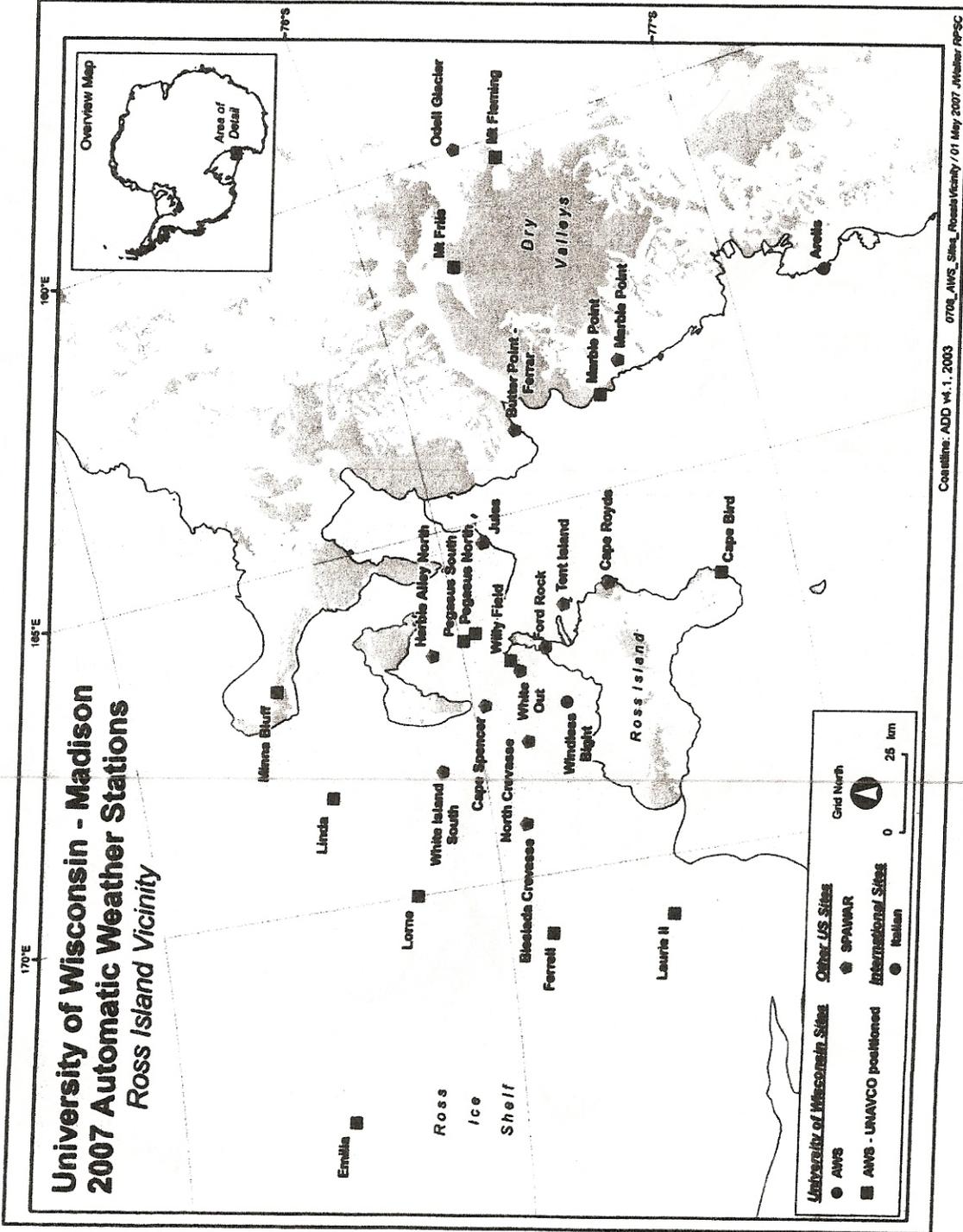
Shelley and Jonathan specifically went to the Mt. Fleming station because it had stopped transmitting wind speed and direction, but they did not know why. *On what day did the station stop sending wind data and what were the prior weather conditions? When they arrived the scientists found something that none of the meteorologists had ever seen in the 25+ years of working in Antarctica. The wind sensor had been broken off the station; both ends (the vane and the “propeller” sections) had broken off and were completely gone. (See the accompanying pictures). The “mtfleming06” photo shows the weather station when it was installed in 2006. If you zoom in you can see how the wind sensor was originally installed.*

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So here is your assignment. Study these pictures, study the weather data provided. Then develop a theory of how and why the wind sensor broke. Your explanation should be detailed and should be supported by the pictures and the weather data. Your explanation should explain; how each end broke off, how each piece disappeared, why the part that was found did not disappear, the direction at which the metal bracket broke. *On your paper write your explanation, followed by the evidence that supports your theory and how it supports your idea. In addition, based on your idea write a way to improve the station design so this doesn't happen again.*

McMurdo 77.9° S
166.7° E



2/5/2007

















